TRANSACTIONS

OF THE

Royal SOCIETY, of arts

Instituted at London,

FOR THE

ENCOURAGEMENT

OF

ARTS, MANUFACTURES, AND COMMERCE;

WITH THE

PREMIUMS OFFERED IN THE YEAR 1822.

VOL. XLI.

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CONTENTS.

AGRICULTURE.

Page.
LIEUT.-COL. WILDMAN on his plantation of Forest Trees .. 1
Captain Hawkins on a Plantation of Forest Trees 7
Messrs. Cowley and Staines on English Opium.............. 15
J. W. Jeston, Esq. on Improvements in the Method of collecting English Opium 17
W. Pyle Taunton, Esq. on an early variety of Horse-Bean 31

CHEMISTRY.

Mr. James Marsh on a portable Electro-Magnetic Apparatus .. 47
Mr. Henry Marshall on improved Melting Pots for Brass-founders and other workers in Metal 52
Mr. J. T. Cooper on an improved Apparatus for the Analysis of Organic Products 56
Mr. J. T. Cooper on a Hydrometer for Saline Solutions 65
Goldsworthy Gurney, Esq. on an Oxy-Hydrogen Blow-pipe .. 70
Mr. Thomas Griffiths on the Use of the Colouring Matter of Red Cabbage as a Test for Acids, Alkalies, &c. 78

POLITE ARTS.

Mr. James Harris on a Method of preserving Oil Colours 80
W. P. Brockedon, Esq. on a Rest for the Use of Painters 84
Mr. C. Warren's Improvements in the Art of Engraving on Steel 88
Mr. W. Deeble on a Method of taking Casts of Leaves and Foliage 95

CONTENTS.

MANUFACTURES.

Mr. W. Cobbett, on the application of Native English Grasses as the Material of Fine Plat 98
Mr. W. V. Shenton on an improved Engine for Tramming Silk 109

MECHANICS.

Mr. Siebe on a Tap for cutting Hollow Screws 115
Mr. Elisha Pechey on an improved Mangle 118
Ed. Speer, Esq. on Centrifugal Check-Hooks 121
Capt. R. S. Wilkinson on an Arm Chest for the Use of Marines 122
Joseph Amesbury, Esq. on an Apparatus to be applied in Cases of Fracture of the Lower Limbs 124
Mr. W. Raynes on a Cap for fractured or dislocated Patella 160
Mr. James Jones on a Vertical Kiln for drying Corn 165
Mr. James Dennett on an Apparatus for Baling Ships 179
Capt. Dansey on a Method of Communication between a stranded Ship and the Shore 182
Mr. J. Evans on a Method of regulating the Strain upon Tackles 190
Mr. J. Elliott on an Apparatus for Dry-grinders 194
Lieut. William Pringle Green, on certain Improvements in the rigging of Ships 198

COLONIES AND TRADE.

Mr. J. F. Denovan on Pickled Herrings 201
Mr. Gregory Blaxland on Wine from New South Wales 285

APPENDIX.

Letter from Mr. Holditch, on his Life Beacon 290
Extract of Mimosa-Bark for the Use of Tanners 291

PREFACE.

THE Committee of Correspondence and Papers have great pleasure in reporting to the Society the success of their endeavours to expedite the preparation of the annual Volume of Transactions. There can be but one opinion respecting the advantages to be derived from early publication, both as respects the interests of the Society and of those whose meritorious exertions for the benefit of the community have been rewarded during the preceding Session. From the commencement of the vacation in the middle of last June to the present time, the Committee of Correspondence and Papers have continued their labours, with an intermission of only six weeks, in order to fulfil the wishes of the Society. These labours include the arrangements with the draftsmen and engravers employed, and the critical examination of the productions of both these classes of artists, also the general superintendence of the preparation of the papers for the press, and a multitude of other particulars which it is unnecessary here to detail. They trust the Society will find, that they have performed the duty committed to them with care and fidelity and with all possible expedition.

With the public at large, and with those members who, from residence in the country, or from other circumstances, are not in the habit of giving their personal attendance at the meetings of the Society and of the Committees, the annual Volume is our only means of communication; hence has arisen the practice of prefacing it by a brief summary of its contents, together with such remarks as may be necessary to put the reader in possession of the motives and objects by which the Society have been actuated in the bestowal of their rewards.

In the Class of Agriculture and Rural Economy will be found two Communications on the subject of Planting Forest Trees. That from Lieut.-Col. Wildman, of Newstead Abbey, is important, both on account of the extent of land thus profitably occupied, and also from some successful novelties of practice, applicable to many of the sandy districts in the midland and eastern counties of England. That from Capt. Hawkins, of Kingsbridge, Devon, shows that to clear away the gorse and other undergrowth, previous to making a plantation, is, in certain situations at least, not only to incur an unnecessary expense, but is actually injurious to the early progress of the young plants.

The exertions of the Society from time to time, in order to encourage the cultivation of the White Poppy and the collection of Opium from it, have been attended with signal success. Messrs. Cowley and Staines, of Winslow, have again obtained the Premium for the production of the largest quantity of Opium, being no less than 143 lbs. Mr. Jeston's Paper on the same subject will be found very valuable as establishing the most expeditious and economical mode of collecting the Opium, and one which entirely obviates the hazard arising from the fickleness and uncertainty of our climate. The Opium produced by both these parties is not only more free from casual impurities than the foreign, but in medical efficacy is at least equal to the very best in the market. This is proved, not only from the high price that has been obtained for it, but from the testimony of professional men of extensive practice and eminent experience. It may reasonably be expected, therefore, that in the course of a few years there will be no necessity of having recourse to foreign countries for this very important article of the materia medica.

Mr. Taunton has obtained the Premium offered by the Society for the production of a variety of Horse Beans, which shall ripen sufficiently early in the year to allow the ground on which it grew to have a Summer Fallow after the collection of the crop.

In the Class of Chemistry will be found a Communication respecting the improved Melting Pots manufactured by Mr. Marshall of Newcastle; and another from Mr. J. T. Cooper, of Lambeth, on the construction of his Hydrometer for Saline Solutions; both of which will be found of use to the practical chemist and the manufacturer. The last-named gentleman has also been rewarded for a very ingenious Apparatus for the ultimate analysis of Organic and other compound Products, which greatly facilitates inquiries into this interesting and, as yet, very imperfectly explored department of science. Mr. Gurney's Oxy-hydrogen Blow-pipe will be found greatly to diminish the risk hitherto attending the use of the mixed gasses as a means of producing the highest degrees of heat; and Mr. Marsh, by condensing in a very portable form the Apparatus necessary for Researches in Electro-Magnetism, has not only brought it within a moderate cost, but has greatly facilitated the power of investigating the laws of this science in situations which, from their locality, are likely to produce very interesting results.

In the Class of Polite Arts the most interesting article is no doubt that which relates to the experiments by the late Mr. Warren, on the Art of Engraving on Steel Plate. The untimely death of this eminent artist has deprived the Society and the Public of a complete Communication from himself on the subject; but care has been taken, by consulting those who were the best acquainted with his mode of practice, to compile a statement of the processes employed by him, which, it is believed, is correct, although, doubtless, neither so interesting nor so fully detailed as it would have been if his valuable life had been longer lent to his family and to his art.

Mr. Brockedon's Rest for the use of Painters will be found in many situations an advantageous substitute for the common Maul-stick; Mr. Harris's application of the Syringe to the purpose of containing Oil Paint for the use of Artists has received the approbation of several professional men. Mr. Deeble's method of taking Casts of Leaves and Foliage, though not new in all respects, is by no means generally known; and will produce representations of these objects (as the specimens in possession of the Society demonstrate) alike remarkable for their fidelity and spirit.

In the Class of Manufactures are two Communications: the first of these, Mr. Shenton's improved Engine for Tramming Silk, avoids many of the inconveniences incident to the machines for this purpose in common use. The second article, being a communication from Mr. Cobbett, on Plat made from English Grass, requires a few words of explanation. In the former Volume of the Society's Transactions is a Communication from Mrs. Wells, of Connecticut, on the use of the stems of a particular species of grass, a native of the New England States of N. America, as a material for fine plat. The specimens produced before the Society were so excellent both in colour and other desirable qualities, as to occasion a considerable reward to be offered to Mrs. Wells, on condition of her furnishing the Society with the particulars of her mode of preparing the grass, and with a certain quantity of the seed for the purpose of endeavouring to naturalize it in this country, and thus securing to ourselves the possession of a material which, when worked by our own people into plat of the same texture and pattern as that imported from Leghorn, might revive this decaying branch of our national industry. Mr. Cobbett, being informed of the proceedings in the Society on this subject, was of opinion that several of our native grasses are in all probability as well adapted to the plat manufacture as the New England grass. He accordingly instituted experiments on the subject, the successful result of which is contained in his very interesting communication inserted in the present Volume.

In the Class of Mechanics, the highest reward, the Large Gold Medal, has been given to Mr. Jas. Jones for his Kiln for Drying Grain; the great superiority of which over those in common use is evident, not only from the Certificate which accompanies the Communication, but from the structure of the machine. Its powers as compared with those in common use are as twelve to one, and all the manual labour of charging and discharging the kiln is saved.

Mr. Amesbury has invented an Apparatus to be used in cases of Fracture of the Lower Limbs, the special intention of which is, to support the limb so as to prevent the fractured parts from being displaced by external accidents or by the involuntary contraction of the muscles; hence the time of confinement to bed is greatly shortened, and the patient is allowed the benefit of exercise on crutches or in a carriage, in aid of the usual powers of nature to effect reunion of the broken bone. An invention analogous in its object to the preceding is Mr. Raynes's ingenious cap to support the knee in cases of Dislocated or Fractured Patella.

Mr. Siebe has invented a simple and convenient Tap for Hollow Screws of the commoner kinds, by which they can be made by the same instrument either right or left-handed, and with one, two, or three threads, according to the uses for which they are intended.

Mr. Speer has proposed a Mode of Stopping Revolving Machinery when running too quick, by taking advantage of the centrifugal divergency of two hooks fixed on the axis of motion, which when expanded fasten on a fixed bar and thus bring the machine to rest.

Capt. Wilkinson, R. M. has invented a well-arranged Chest to contain the Arms of Marines on board ship, by which they are secured from injury themselves, and from wounding the men when taken out hastily, particularly at night, as is but too frequently the case with the inconvenient chests in which they are usually deposited.

That no opportunity may be neglected by the Society of alleviating as far as is in their power the perils incident to sea-faring persons, two Communications have been inserted in the present Volume. One is an Apparatus proposed by Mr. Dennett as more efficacious in Baling Leaky Ships than the canvass buckets at present resorted to; the other is a very ingenious modification of the Common Kite, in order to effect a Communication between a Stranded Ship and the Shore, invented by Capt. Dansey, R. Art.

Mr. Evans's Mode of Combining and Regulating the Strain of different Tackles applied to lifting the same weight, will, it is hoped, be found to be useful in our dock yards and other situations where articles of very unequal weight are required to be raised.

Mr. Elliott's Apparatus for conveying away the Dust occasioned by Dry-grinding articles of Iron and Steel will be found to be more simple than others heretofore rewarded by the Society, and it is hoped may contribute to the relief of that class of artizans for whom it is intended.

Mr. Pechey's Mangle will be found to effect the alternate motion of the box and rollers, by means of the continued revolution of the handle in one direction, through the medium of a simpler contrivance than has hitherto been applied to this purpose.

Lieut. Green's proposed Improvements in the Rigging of Ships are submitted to the consideration of those who are professional judges of them.

In the Class of Colonies and Trade, the sum of Fifty Guineas has been given to Mr. J. F. Denovan, of Aberdour, in Fifeshire, for his Improvements in the mode of Salting White Herrings, and for his successful competition with the Dutch fishers in the market of Hamburgh. This is the third reward of similar value which has been granted to Mr. Denovan, and the Society have ample reason to be satisfied with the result. Buffetted by repeated adverse accidents, this active and skilful fisher has nevertheless persevered in his useful enterprise. For two successive years he has by his activity and the intrinsic superiority of his fish, carried off the prime prices at the Hamburgh market; and has communicated to the Society, and through the Society to the public, all the particulars of his manner o curing the celebrated herrings of the West of Scotland, and of rendering them not merely equal, but decidedly superior, to Dutch herrings, which though cured probably with equal skill, are naturally and essentially an inferior variety of fish. In confirmation of this it may be allowed to state, that in his last letter he mentions having received a small order for his herrings to be sent to Batavia.

The last article on the list is a letter from Mr. Blaxland, relative to a small cargo of wine made from the Claret Grape cultivated in his vineyard in New South Wales. It was well worth while for the Society to mark and authenticate by its medal the date of the first importation of wine from that flourishing colony into the parent country. Its quality is such as to give well-grounded expectations of its forming a valuable article of trade in the Indian and perhaps in the British market, when age shall have diminished the rampant vigour of the young stocks, and experience shall have pointed out the most advantageous mode of fermenting the wine, and of its subsequent treatment previous to exportation.

ERRATA AND CORRIGENDA,

IN VOLUME XL.

Page 5, *at the bottom, for* " 574*l.* 11*s.* 7*d.*" *read* 577*l.* 14*s.* 7*d.*

—— 29, *line* 19, *after* " subject," *add* a model of the stack is placed in the Society's Repository.

—— 80, *instead of the last paragraph but one, substitute the following:* The rest note *h*, with the notch variously situated, as in the plate, indicates, when placed on the upper line, the semi-breve and dotted semi-breve rests; when placed on the middle space, the minim, dotted minim, crotchet, and dotted crotchet rests; and when placed on the lower raised line, the quaver, dotted quaver, semi-quaver and dotted semi-quaver.

Page 93, *line* 9, *for* " A E B," *read* A F B.
—— 95, — 2, *for* " N S, P T, R U, M P, and S," *read* M T, P V, and S V.
—— — — 4, *for* " water-pipe," *read* water-tight.
—— — — 7, *for* " P," *read* F.
——101, — 14, *for* " it," *read* A.
—— — — 15, *for* " internal," *read* external.
—— — — 16, *for* " external," *read* internal.
——113, — 13, *for* " E," *read n.*
——126, — 3 *from bottom, for* " 4," *read* a.
——130, — 12, *insert a comma between* " *k* and *l*"
—— — — 13, ditto *between* " *n* and *o*."
——131, — 6, *for* " fig. 1," *read* figs. 1 and 2.
——134, — 4, *for* " following," *read* preceding.
——143, — 18, *dele* " and wet."
——144, — 20, *dele* " both wet and."
——150, — 17, *for* " raising," *read* rasing.

ERRATA.

Page 159, *line* 19, *after* " piece," *add* Fig. 5 is a side view of the cross scale and slide.

——166, — 2 *from bottom*, *for* " 92196," *read* ,92196.

——167, — 11, *for* " 112," *read* ,112.

——182, — 2 *from bottom*, *after* " *i i i i*," *add* figures 11 and 14.

——186, — 19, *for* " treaddle," *read* headdle.

—— — — 20, *for* " treaddles," *read* headdles.

—— — — 22, *for* " treaddles," *read* headdles.

——196, — 19, *after* " of larger size," *add* and by reason o the increased number of cords.

—— — — 28 *to* 33, " The common," *to* " per week," *omit.*

——213, — 5 *from bottom*, *for* " fig. 2," *read* fig. 1.

——226, — 5 *from bottom*, *for* " *x y z*," *read* *w x y*.

IN THE ANALYTICAL INDEX.

Page 11, *between* " Gun-powder mills," *and* " Haggitt Fr.," *insert* Hack, Mr. T., an universal chuck for Turners, xxxvii, 87.

—— 20, *before* " Mr. Collinson Hall," *insert* Mr. T. Hack, for an universal chuck for Turners, xxxvii, 87.

—— 25, *at the end of the article* " Millstones of Tuscany," *add* see also Corn-mills.

—— 45, *before* " Turnip-sower," *insert* by Mr. T. Hack, xxxvii, 87.

VOLUME XLI.

Page 128, *line* 15, *for* " this," *read* their.

—— 129, — 3, *for* " observations," *read* objections.

—— — — 5, *for* " the," *read* their.

—— 132, — 7, *for* " press," *read* pass.

—— — — 29, *for* " effects," *read* imperfections.

—— 133, — 13, *for* " extremity," *read* extremities.

ERRATA.

Page 134, *line* 4, *for* “rested,” *read* rolled.
—— — — 14, *for* “acting,” *read* action.
——136, — 18, *for* “opposition,” *read* apposition.
——137, — 1, *for* “rested,” *read* rolled.
——140, — 10, *for* “observation,” *read* observations.
——141, — 30, *for* “these,” *read* their.
——144, — 13, *for* “opposition,” *read* apposition.
——155, — 6, *cancel* “and the brass plate B.”

——178, — 3 *from bottom, for* “Hawes,” *read* Howes.
——230 *(note) last line, for* “§ 28,” *read* § 29.
——298, *before* “Henry Goodwyn,” *insert,*
T. GILL.
Technical Repository for 1823, 8vo.

Premiums offered

IN THE SESSION 1823—1824.

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ADVERTISEMENT TO THE PUBLIC.

THE chief object of the SOCIETY is, to promote the Arts, Manufactures, and Commerce of this Kingdom, by giving honorary or pecuniary Rewards, as may be best adapted to the case, for the communication to the SOCIETY, and through the SOCIETY to the Public, of all such useful Inventions, Discoveries, and Improvements (whether specified in these premiums or not) as tend to that purpose; in pursuance of this plan, the SOCIETY have already expended upwards of a HUNDRED THOUSAND POUNDS, derived from voluntary subscriptions and legacies.

The meetings of the SOCIETY are held every Wednesday, at seven o'clock in the evening, from the first Wednesday in November to the second Wednesday in June. The Committees meet on other evenings in the week during the session, for the purpose of taking into consideration the subjects referred to them by the SOCIETY. A person desirous of becoming a Member of the SOCIETY, may be proposed according to the following form, which must be signed by three Members of the SOCIETY, and delivered in to the Secretary:

A. B. [*Trade, Profession or Designation of the Candidate*] proposed as a Member of the Society for the Encouragement of Arts, Manufactures, and Commerce by

C. D.
[*Date*] E .F.
G. H.

Peers of the Realm, or Lords of Parliament are, on their being proposed, immediately balloted for: the names of other persons proposed to become Members are read by the Secretary to the SOCIETY, and are then inserted in lists which are hung up in the SOCIETY's room; they are balloted for at the second following ordinary meeting. In both cases, if two-thirds of the Members then voting ballot in their favour, they are deemed Perpetual Members upon payment of not less than Twenty Guineas in one sum, or Subscribing Members upon payment of any sum not less than Two Guineas annually.

Ladies are eligible as Members of the SOCIETY, and alone are entitled to vote by proxy at elections, through the medium of any gentleman who is a Member, on his producing a written authority for the same.

Members are entitled to vote and assist in all the business of the SOCIETY and of the several Committees. They have also the privilege of recommending two persons as visitors at the meetings of the SOCIETY; and, by addressing a note to the housekeeper, of introducing their friends on any week day, except Wednesday, between the hours of ten and two, to examine the various Models, Machines, and Productions, in different branches of Arts, Manufactures, and Commerce, for which rewards have been bestowed; also to inspect the magnificent series of Moral and Historical Paintings, executed by the late J. Barry, Esq. which, with some valuable Busts, Statues, Portraits, &c. decorate the public rooms of the Society.

Members have the use of the Society's Library, which is valuable, and annually increasing by the purchase and donation of scientific and useful books, and of engravings. Contributions from Members and others, in augmentation of the Library, and of the collection of Maps and Prints, will be thankfully received, and duly acknowledged in the annual volume of the Society's Transactions, to a copy of which every Member is entitled.

⁂ To persons inclined to leave a sum of money to this Society by Will, the following form is offered for that purpose:

Item.—*I give and bequeath to A. B. and C. D. the sum of upon condition, and to the intent that they, or one of them, do pay the same to the Collector for the time being, of a Society in London, who now call themselves the Society for the Encouragement of Arts, Manufactures, and Commerce; which said sum of I will and desire may be paid out of my personal estate, and applied towards carrying on the laudable designs of the Society.*

The Society desire it to be clearly understood, that as a Body they are not responsible for any opinion or representation of facts contained in their Volumes. And the Public are requested to guard against impositions, from persons advertising as having Patents for Articles rewarded by the Society; they are also cautioned against purchasing articles sold under the pretended sanction of the Society's name.

The Society have lately published the 40th *Volume* of their Transactions, which may be had by Members on application to the Housekeeper. Complete Sets of their Transactions, or any single Volume, may be purchased at the Society's house; where may be had also,

An *Analytical Index of the first Twenty-five Volumes* of the Transactions to the Termination of the Session, June, 1807, price 1s.

Do. continued to the end of the 40th volume price 1s.

A List of the Machines and Models in the Society's Repository, to the year 1813, inclusive, *gratis*.

A Catalogue of Books in the Society's Library, 1s.

A Description of Mr. Barry's Paintings in the Great Room of the Society, *gratis*.

All communications are to be made by letter, addressed to Arthur Aikin, Esq. the Secretary, at the Society of Arts, &c. Adelphi, London.

And where articles are sent by Sea for the Society, the Bills of Lading are to be addressed to the care of William Vaughan, Esq., 70, Fenchurch-street, London, who has undertaken to receive them for the Society.

GENERAL NOTICE TO CANDIDATES.

THE great object of the SOCIETY in rewarding individuals is, to draw forth and give currency to those inventions and improvements which are likely to benefit the public at large. Candidates are therefore requested to observe, that if the means by which the respective objects are effected require an expense or trouble too great for general purposes, the SOCIETY will not consider themselves bound to give the offered reward; but, though they expressly reserve the power, in all cases, of giving such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the Candidates may be assured the SOCIETY will always judge liberally of their several claims.

The SOCIETY by no means restrict their liberality to the subjects for which premiums are specially offered, but will take into consideration, and will reward by a bounty proportioned to its merit, any communication, the subject of which is of a practical nature, and calculated to promote the public good.

All communications are to be made by letter addressed to the Secretary, and are to contain full and particular details, according to the nature of the Subject, as well as accurate descriptions of such drawings and Models as form part of the communication: the Models to be sent CARRIAGE PAID.

In those cases in which certificates are required to be produced in claim of premiums, they should be expressed, as nearly as possible, in the words of the conditions attached to the respective premiums, and be signed by disinterested persons, who have a positive knowledge of the facts stated.

The premiums are designed for the United Kingdom, unless expressly mentioned to the contrary; but no claim will be attended to, unless the previous conditions have been fully complied with.

No person shall receive any premium, bounty, or encouragement, from the SOCIETY, for any matter for which he has obtained any premium or reward from any other SOCIETY, or for which he has obtained, or purposes to obtain a patent; it being a condition stipulated with every candidate, that all articles rewarded by the SOCIETY, shall be freely given up to the public, to be made or manufactured by any person whatever.

All Models, the production of which is attached as a condition to any premium, shall, upon the delivery of such premium, remain the property of the SOCIETY.

Where premiums or bounties are obtained in consequence of specimens produced, the SOCIETY will retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No member of this SOCIETY shall be a Candidate for, or entitled to receive, any premium, bounty, or reward whatsoever, except the honorary medals of the SOCIETY.

No Candidate, not a member, shall be present at any meeting of the SOCIETY or Committees, or be admitted at the SOCIETY'S rooms, after having delivered in his claims, until such claims are adjudged, unless summoned by the Committee.

A Candidate for a premium, or a person applying for a bounty, being detected in any attempt to impose on the SOCIETY, shall forfeit such premium or bounty, and be deemed incapable of obtaining any for the future.

The consideration of the Claims for the premiums offered in the present List, will take place during the Session of the SOCIETY commencing on Wednesday, the 5th of November, 1823. The several Candidates and Claimants, to whom the SOCIETY shall adjudge Premiums or Bounties, are to attend on the last Wednesday in May, at eleven o'clock in the forenoon precisely, to receive the same, that day being appointed by the SOCIETY for the Distribution of their Rewards; and before that time no Premium or Bounty will be delivered, except to those who are about to leave the Kingdom.

In cases where the SOCIETY may think fit to admit excuses for not attending in person, Deputies may be substituted to receive the rewards, provided such Deputies are either Members of the SOCIETY, or superior Officers thereof.

PREMIUMS IN AGRICULTURE.

N. B.—The Winchester bushel is the measure referred to for grain; and, as the Acres of different districts vary in extent, it is necessary to observe, that the Society mean Statute acres of five and a half yards to the rod or pole, and they request that all communications to them may be made agreeably thereto.

1. IMPROVEMENT OF LAND.

Gaining Land from the Sea.

1. TO the person who shall have gained the greatest quantity of Land from the Sea, not less than fifty acres, on the coast of Great Britain or Ireland; —*the Gold Medal.*

Certificates of the quantity of Land, and that the experiments were begun after the first of January 1818, to be produced to the Society on or before the first Tuesday in February, 1824.

2. The same premium is extended one year farther, on the same conditions.

Improving Waste Land.

3. For the most satisfactory account of a method, superior to any hitherto practised, of improving Land lying Waste and uncultivated, in which either of the following soils predominate, viz. clay, gravel, sand, chalk, peat, or bog, verified by experiments on not less than fifty acres of land;—*the Gold Medal.*

4. For the next greatest quantity, not less than thirty acres;—*the Silver Medal.*

It is required, that the Land, before such improvement, be absolutely uncultivated and in a great measure useless, and that in its improved state, it be inclosed and cultivated.

Certificates of the number of acres, of the quality of the Land so improved, with a full account of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced to the Society on or before the first Tuesday in February, 1824.

Laying down Light Land to Permanent Grass.

5. To the person who shall ascertain, by actual experiment, the comparative merit of the following modes of laying down Light Soils to Permanent Grass, with a view to obtain a good sward in the shortest time, viz. by inoculating or transplanting, as recently practised in the county of Norfolk, either with or without corn, by sowing grass-seeds in the Spring, in the common way, with corn buck-wheat, &c. or by sowing grass-seeds alone in the Autumn;—*the Gold Ceres Medal.*

It is required that every operation, and the expense of each mode, be fully described, with proper certificates of the soil and subsoil in each experiment being respectively of similar qualities, and of their having previously been similarly treated as to cultivation and manure, and of at least one acre having been tried under each system, to be produced to the Society on or before the last Tuesday in February, 1824.

Manures.

6. For the most satisfactory set of experiments, to ascertain the comparative advantages of the following Manures, used as top-dressings on grass and corn-land, viz. soot, coal-ashes, wood-ashes, lime, gypsum, bones, night-soil, or any other fit article;—*the Gold Medal.*

It is required that the above experiments be made between four of the above-mentioned Manures, and that not less than two acres of land be dressed with each Manure.

7. For similar comparative experiments, on two or more kinds of Manure; —*the Silver Medal.*

An account of the nature of the soil, the quantity. and expense of the manure and crops, with certificates, to be produced on or before the last Tuesday in February, 1824.

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2. PLANTATIONS.

Forest Trees.

8. To the person who shall have inclosed and planted, or set, the greatest number of acres (not less than fifty) of land that is incapable of being ploughed,

or otherwise unfit for tillage, with the best sorts of Forest Trees, namely, oak, Spanish chesnut, ash, elm, beech, alder, willow, larch, spruce, or silver fir (with or without screens of Scotch fir) adapted to the soil, and intended for timber trees, between the first of October 1819, and the first of April 1820;—*the Gold Medal.*

9. For the second greatest quantity of land, not less than thirty acres;—*the Silver Medal.*

A particular account of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper certificates that they were in a healthy and thriving state two years at least after making the plantations, to be delivered to the Society on or before the second Tuesday in February, 1824.

N. B. With the above Forest Trees, the seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

Oaks, not transplanted.

10. For having set, in the season 1817-18, the greatest quantity of land, not less than fifteen acres, with Acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber;—*the Gold Medal.*

11. For the second greatest quantity of land, not less than ten acres, set agreeably to the above conditions;—*the Silver Medal.*

Certificates of setting agreeably to the above conditions, and that there are not fewer than thee hundred young Oaks, in good condition, on each acre, to be delivered to the Society on or before the first Tuesday in February, 1824.

Larch.

12. For having planted out, between June, 1820, and June, 1821, the greatest number of Larch Trees, not fewer than fifty thousand, and for having effectually fenced and preserved the same, in order to raise Timber;—*the Gold Medal.*

13. For the next greatest number, not fewer than thirty thousand;—*the Silver Medal.*

Certificates of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the last Tuesday in February, 1824.

N. B. The Larch Trees may be planted either mixed with other trees, or by themselves, as may best suit the convenience of the planter.

Norway Fir.

14. To the person who shall have imported from Norway the greatest number, not less than two thousand, of Norway Fir Seedlings, and shall have planted the same during the year 1821, placing them at sufficient distances from each other to stand for timber trees;—*the Gold Medal.*

Certificates of the number of plants, that they were in a thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society, on or before the first Tuesday in February, 1824.

N. B. It is recommended to plant seedlings of about three or four years growth, and in a moderately good soil, somewhat sheltered; the wood from the district of Christiana is esteemed the best for carpenters' and joiners' use; and for spars and ufers the trees near to Long Sound are most valued.

Walnut Trees.

15. For having planted the greatest number of Walnut Trees, not less than two hundred, since June, 1821, and for having effectually fenced and preserved the same, in order to raise timber;—*the Gold Medal.*

16. For the next greatest number, not fewer than one hundred;—*the Silver Medal.*

Certificates of having planted agreeably to the above conditions, and that the plants were in a healthy and thriving state two years at least after making the plantation, and specifying the distance of the plants from each other, to be delivered to the Society on or before the first Tuesday in April, 1824.

Securing Plantations.

17. To the person who shall give to the Society the most satisfactory ac-

count, founded on experience, of the most effectual and least expensive method of securing young plantations of timber trees, and hedge rows, from hares and rabbits, as well as from sheep and cattle, which at the same time shall be least subject to the depredations of wood-stealers;—*the Gold Ceres Medal*, or *Thirty Guineas*.

The accounts, and certificates of the efficacy of the method, to be produced to the Society on or before the last Tuesday in March, 1824.

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3. COMPARATIVE EXPERIMENTS ON RAISING TREES.

Oaks.

18. To the person who shall have ascertained in the best manner, by actual experiment, continued for five years at least, the comparative merits of the different modes of raising Oaks for timber, from acorns set on land properly dug or tilled, from acorns set by the spade or dibble, without digging or tillage, either on a smooth surface, or among bushes, fern, or other cover; and from young plants previously raised in nurseries, and transplanted: regard being had to the expense, growth, and other respective advantages of the several methods;—*the Gold Medal*.

The accounts and proper certificates that not less than one acre has been cultivated in each mode, to be produced to the Society, on or before the first Tuesday in February, 1824.

Walnuts.

19. To the person who shall communicate to the Society an improved mode of propagating the superior varieties of Walnuts, either by budding, grafting, or any other mode, except sowing;—*the Gold Medal*.

Certificates that not fewer than fifty trees have been so raised; with a full account of the method practised, to be produced to the Society, on or before the first Tuesday in April, 1824.

4. CULTIVATION OF CORN AND OTHER PLANTS.

Wheat.

20. For the best set of experiments made on not less than twelve acres, four acres being sown broad-cast, four drilled, and four dibbled, in order fully to ascertain which is the most advantageous mode of cultivating wheat;—*the Gold Medal*.

It is required that every operation, and the expense of each mode of culture, be fully described; and that proper certificates of the nature and condition of the land on which the experiments were made, together with an account of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the last Tuesday in February, 1824.

Grass Seeds.

21. To the person who shall raise the greatest quantity of each or any of the following named grass-seeds, viz.—Meadow Fox-tail (alopecurus pratensis), Sweet-scented Vernal-grass (anthoxanthum odoratum), Timothy-grass (phleum pratense), meadow Fescue-grass (festuca pratensis), smooth-stalked Meadow-grass (poa pratensis), rough-stalked Meadow-grass (poa trivialis), rough Cock's-foot (dactylis glomerata), perennial Ray grass (lollium perenne);—*the Silver Medal*.

It is required that certificates from persons who have viewed them in a proper state to identify that they are one or other of the seeds above mentioned, indicating clearly the particular species, and noticing the quantity produced of such seeds, free from weeds or mixture of other grasses, together with proper samples of the seeds, be produced to the Society on or before the first day of March, 1824.

Seed of the Grass employed in making Fine-Plat.

22. To the person who shall, in the year 1823, collect the greatest quantity of seed, not less than one pound, from plants raised in Great Britain of a species of Poa, a native of Connecticut in the United States, the stems of which are employed there as the material for fine plat as described in the 40th volume of

the Society's Transactions, and seeds of which have been imported and distributed by the Society;—*the Silver Medal*, or *Twenty Guineas.*

23. For the next greatest quantity not less than half a pound;—*the Silver Ceres Medal*, or *Ten Guineas.*

Satisfactory certificates, with a sample of the seed and of the grass from which it was produced, to be sent to the Society on or before the first Tuesday in March, 1824.

Beans.

24. To the person who shall discover and cultivate, on not less than five acres, a species of Horse-beans or Tick-beans which, being sown in the spring, will ripen their seeds before the 21st of August;—*the Silver Medal.*

It is required that a particular account of the bean, the cultivation, and the expense attending it, with proper certificates of the nature and condition of the land on which the experiments were made, together with an account of the produce, the weight per Winchester bushel, and a sample of not less than a peck, be produced to the Society on or before the last Tuesday in February, 1824. It is apprehended that if a Bean should be brought into cultivation with the habits of hotspur or other early peas, it would in a great measure escape the danger arising from the collier insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat.

Parsnips.

25. To the person who shall cultivate the greatest quantity of land, not less than five acres, with Parsnips, for the particular purpose of feeding cattle or sheep;—*the Silver Medal.*

Certificates of the quantity of land so cultivated, with a particular account of the nature of the soil and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the Parsnips, and the advantages resulting from the practice, to be produced to the Society on or before the last Tuesday in February, 1824.

Potatoes.

26. To the person who shall, in the year 1824, cultivate the greatest quantity of land, not less than fifty acres, with Potatoes of such qualities as shall be fit for the use of the table in the months of April, May, and June, 1825;—*the Gold Medal*, or *Thirty Guineas.*

Proper certificates, along with other necessary particulars, to be sent to the Society on or before the first Tuesday in Nov. 1825.

Preventing the rotting of Clover Plants.

27. To the person who shall communicate to the Society, a satisfactory account of some method successfully employed in preventing the failure of Clover Crops, in consequence of the Plants rotting on the ground in the Winter and Spring; which they commonly do in patches, appearing to extend from a center;—*the Gold Ceres Medal.*

Full particulars and satisfactory certificates to be produced to the Society on or before the second Tuesday in March, 1824.

Hemp.

28. The Society, wishing to encourage the growth of Hemp, in every part of the united empire, offer to the person who shall have sown with Hemp, either broadcast or in drills at least eighteen inches asunder, the greatest quantity of land in any part of the united empire, not less than fifty acres statute measure in the year 1823, and at the proper season shall have caused to be plucked the summer Hemp (or male Hemp bearing no seed), and continue the winter Hemp (or female Hemp bearing seed) on the ground until the seed is ripe;—*the Gold Medal.*

29. For the next greatest quantity, not less than twenty-five acres;—*the Silver Medal.*

Certificates of the number of acres, of the distance of the drills, of the plucking of the Hemp, with a general account of the soil, cultivation, and produce, to be delivered to the Society along with fourteen pounds of the Hemp and two quarts of the seed, on or before the last Tuesday in February, 1824.

Cultivation of the white Poppy (Papaver somniferum) and Extraction of the Opium.

30. To the person who shall prepare the greatest quantity of Opium, not less than 250 lbs. from the white Poppy (Papaver somniferum), raised by the claimant, in Great Britain or Ireland, in the year 1823;—*the Gold Medal.*

31. To the person who shall obtain the next greatest quantity, not less than 120 lbs, raised by the claimant as above, he not having previously obtained the Society's premium; — *the Gold Ceres Medal, or Thirty Guineas.*

Certificates of the quantity and quality of the produce, with specimens, and a full description of the mode of culture, and of the extraction and preparation of the Opium, to be sent to the Society on or before the first Tuesday in February, 1824.

Persons proposing to claim the above premium are referred to Mr. Young's communications on the subject, published in the 37th and 38th Vols. of the Society's Transactions.

A valuable communication on the same subject is inserted in the 40th Volume.

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5. PRESERVATION OF VEGATABLE PRODUCE.

Preserving Turnips, Carrots, Parsnips, Beets, or Mangel Worzel.

32. To the person who shall discover to the Society the best and cheapest method of preserving these roots perfectly sound, and in every respect fit for supporting and fattening sheep and neat cattle during the months of March, April, and May;—*the Silver Medal.*

It is required that a full and accurate account of the method employed, and the expense attending the process, together with certificates that the produce of four acres, at the least, has been preserved according to the method described, and applied to the feeding of sheep and neat cattle; that the whole were drawn out of the ground before the first day of January, in order to clear the greater part of it previous to its being prepared for corn, and to save the soil from being exhausted by the turnips or other roots, and also of the weight of an average sixteen perches of the crop; be produced to the Society on or before the last Tuesday in April, 1824.

Preserving Cabbages.

33. To the person who shall discover to the Society the best and cheapest method of preserving drum-headed Cabbages perfectly sound, and in every respect fit for supporting and fattening sheep and neat cattle during the months of February, March, and April;—*the Silver Medal.*

Conditions the same as for preserving turnips, Art. 32.—And the accounts to be produced on or before the last Tuesday in April, 1824.

Harvesting Corn in Wet Weather.

34. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of Harvesting Corn in Wet Weather;—*the Gold Medal.*

A full account of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and certificates that at the least the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples; to be produced to the Society on or before the first Tuesday in February, 1824.

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6. DESTROYING INSECTS AND OTHER VERMIN.

Destroying the Grub of the Cockchafer.

35. To the person who shall discover to the Society, an effectual method, verified by repeated and satisfactory trials, of destroying the Grub of the Cockchafer, the Wire-worm, or the Slug, or of preventing or checking their destructive ravages on corn, peas, beans, and turnips;—*the Gold Medal.*

The accounts, with proper certificates, to be produced on or before the first Tuesday in February, 1824.

Destroying the Fly on Hops.

36. To the person who shall discover to the Society an easy and efficacious method of destroying the Fly on Hops, superior to any hitherto known;—*the Gold Medal.*

Accounts and certificates of the method having been successfully practised on not less than four acres of Hop ground; to be delivered to the Society on or before the first Tuesday in February, 1824.

Destroying the Fly on Turnips.

37. To the person who shall discover to the Society an easy and efficacious method of destroying the Fly on Turnips, or of preventing its injurious effect on the crop;—*the Gold Medal.*

Conditions the same as for the preceding premium.

Preventing the Blight on Fruit Trees and Culinary Plants.

38. To the person who shall discover to the Society the most effectual method of preventing the Blight or ravages of Insects, on Fruit trees and Culinary Plants, superior to any hitherto known or practised, and verified by actual and comparative experiments;— *the Gold Medal.*

The accounts, with proper certificates, to be delivered to the Society on or before the last Tuesday in February, 1824.

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7. CATTLE AND SHEEP.

Feeding Cattle.

39. For the best experiments on Stall feeding Cattle (not fewer than five head of different breeds), to be continued for the space of twelve months, in order to prove the earliest maturity and greatest propensity to fatten, of the most approved breeds of cattle in Great Britain, or Ireland, specifying the nature of the food given, together with the daily consumption of each beast, with its weekly increase in weight, and such other observations as may be deemed of consequence;—*the Gold Medal.*

A full account of the methods employed, and of the expenses attending the same, and certificates of the sundry matters stated, to be produced on or before the second Tuesday in Feb. 1824.

Protecting Sheep.

40. To the person who shall communicate to the Society the best and cheapest method of protecting large flocks of sheep, not less than one thousand, from the inclemency of the weather during the winter months, particularly in mountainous districts, where the practice of protecting sheep has not hitherto been adopted;—*the Gold Medal.*

A particular account of the experiments made, with the advantages arising therefrom, together with the expense, and certificates of its utility, to be produced to the Society on or before the first Tuesday in March, 1824.

N. B. It is required that the certificates shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time; together with the general method of managing them.

Cachemire Shawl-Goat.

41. To the person who shall have kept in a healthy state, in any part of the United Kingdom, during the last three years preceding the first of February, 1824, the greatest number of Cachemire Shawl-Goats;—*the Gold Medal.*

Certificates that at least five goats are in good health at the time of making the communication, together with full particulars of the method of treating them, to be produced to the Society on or before the first of March, 1824.

The same premium is extended to the year, 1825.

Cure of the Rot in Sheep.

42. To the person who shall discover to the Society the best and most effectual method of curing the Rot in Sheep, verified by repeated and satisfactory experiments;—*the Gold Medal,* or *Fifty Guineas.*

It is expected that the Candidates furnish accurate accounts of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper certificates, must be delivered to the Society on or before the last Tuesday in February, 1824.

Preventing the ill-effects of Flies on Sheep.

43. To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by Flies;—*the Silver Medal.* or *Ten Guineas.*

It is required that the method be ascertained by repeated experiments, and that a certificate of its efficacy be delivered to the Society on or before the first Tuesday in February, 1824.

9. AGRICULTURAL MACHINES.

Irrigation of Land.

44. To the person who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for the purpose of irrigating land, superior to and cheaper than any other method now in use;—*the Gold Medal*, or *Fifty Guineas.*

A model, on a scale of one inch to a foot, with certificates that a machine at large, on the same construction, has been used, specifying the quantity of water delivered in gallons per hour, and the height to which it is raised, to be produced to the Society on or before the first of March, 1824.

Paring Plough.

45. To the person who shall invent and produce to the Society a Machine or Plough for the purpose of paring land preparatory to burning, superior to any hitherto known or in use for such purpose, and to be worked by not more than one man and two horses;—*the Silver Medal*, or *Twenty Guineas.*

The machine and certificates that at least ten acres have been pared by it in a proper manner, to be produced to the Society on or before the first of February, 1824.

Dibbling Machine.

46. To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances and proper depths;—*the Silver Medal*, or *Fifteen Guineas.*

The Machine, with certificates that at least three acres have been dibbled by it, to be produced to the Society on or before the second Tuesday in February, 1824.

Thrashing Machine.

47. To the person who shall invent a Machine by which corn of all sorts may be thrashed more expeditiously, effectually, and at a less expense, than by any method now in use, and without injuring the straw more than thrashing by the flail;—*the Gold Medal.*

The Machine, or a Model, with proper certificates that such a Machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1824.

PREMIUMS

FOR THE PRACTICAL APPLICATION OF DISCOVERIES AND IMPROVEMENTS IN

CHEMISTRY, DYEING, AND MINERALOGY.

Increasing Steam.

48. To the person who shall invent and discover to the Society a method, verified by actual experiment, of increasing the quantity or force of Steam in

Steam Engines, with less fuel than has hitherto been employed, provided that in general the risk of accidents be not increased, and the whole amount of the expenses in using steam engines be considerably lessened;—*the Gold Medal*, or *Fifty Guineas.*

To be communicated to the Society on or before the last Tuesday in February 1824.

Prevention of Smoke.

49. To the person who shall invent and produce to the Society the best and easiest means, superior to any now before the public, of preventing the emission of dense Smoke, from the chimnies of steam-engines, breweries, and manufactories;—*the Gold Medal*, or *Fifty Guineas.*

Certificates that the means proposed have been found to succeed in practice, to be produced to the Society on or before the first Tuesday in February, 1824.

Test for Arsenic.

50. To the person who shall discover to the Society a test for arsenic in solution, superior to any hitherto known;—*the Gold Medal.*

It is required that any communication in claim of this premium shall include a method of detecting arsenic, not only in its usual form of white arsenic, or arsenious acid, but also in the state of arsenic acid, and of the soluble salts formed by the combination of arsenious and arsenic acids with alkaline substances.

Claims for this premium to be delivered in on or before the last Tuesday in February, 1824.

Preventing the Ill-Effects of Smelting Ores.

51. To the person who shall invent and discover to the Society the most effectual method of preventing the ill-effects arising to vegetation and animal life, from the sulphureous, arsenical, or other noxious fumes disengaged in smelting the ores of Copper, Zinc, Lead, Tin, Iron, &c. in the large way, and, if possible, of converting those pernicious fumes to useful purposes, in a manner superior to any hitherto known, or in use;—*the Gold Medal*, or *Fifty Guineas.*

It is required that a full account of the process employed, with certificates of its being successfully carried into effect, be produced to the Society on or before the first Tuesday in March, 1824.

Fine Bar Iron.

52. To the person who shall make the greatest quantity of Bar-iron, not less than ten tons, with coke, from coke pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for being converted into steel;—*the Gold Medal*, or *Fifty Guineas.*

Samples, not less than one quarter of a hundred weight, with certificates that the whole quantity, is of equal quality, to be produced to the Society on or before the first Tuesday in March, 1824.

Refining Copper from the Ore.

53. To the person who shall discover to the Society a method of separating, purifying, and refining Copper from the Ore, so as to render it fit for those purposes to which fine copper is now applied, and by a process cheaper than and superior to any hitherto known or in use;—*the Gold Medal*, or *Fifty Guineas.*

Certificates that not less than three tons have been so prepared or refined, and a quantity not less than 14 lbs. of the copper so refined, to be produced to the Society on or before the last Tuesday in February, 1824.

Refining Zinc from the Ore.

54. To the person who shall invent and communicate to the Society a process of refining Zinc from the Ore superior to any hitherto known or in use, and fit for the purpose of making fine brass;—*the Gold Medal*, or *Fifty Guineas.*

Conditions the same as in the preceding premium.

Preparing Brass.

55. To the person who shall discover a method of making Brass from materials the produce of Great Britain or Ireland, of superior quality to that commonly manufactured in this country, and equal to foreign brass;—*the Gold Vulcan Medal*, or *Thirty Guineas.*

A full account of the process, and of the ingredients employed, together with their proportions, and certificates that one ton has been so manufactured, and a sample of the brass, not less than 14lbs. to be produced to the Society on or before the last Tuesday in February, 1824.

Improved Earthenware Crucibles.

56. To the person who shall invent and discover to the Society a process for manufacturing earthenware crucibles which shall be capable of enduring higher degrees of heat than those now in use, and shall not be too expensive;—*the Gold Vulcan Medal*, or *Thirty Guineas.*

A full account of the process, and of the materials employed, with satisfactory certificates of the crucibles having been found to answer in use, and specimens of the crucibles, to be produced to the Society on or before the last Tuesday in March, 1824.

Preparation of Sulphuric Acid, from Sulphur, without the Use of any Nitric Salt.

57. To the person who shall prepare the largest quantity (not less than one ton) of Sulphuric Acid from sulphur, without any nitric salt, of a specific gravity not inferior to the best sulphuric acid of commerce;—*the Gold Medal*, or *Fifty Guineas.*

Certificates that not less than the above quantity of such an acid has been prepared, together with a sample, and a full account of the process employed, to be produced to the Society on or before the first Tuesday in February, 1824.

Purification of Coal Gas.

58. To the person who shall discover the cheapest method of purifying the inflammable gas procured from coal, superior to any method now in use;—*the Gold Vulcan Medal*, or *Thirty Guineas.*

A full account of the process, with certificates of its fully answering the intended purpose, to be produced to the Society on or before the second Tuesday in February, 1824.

Refining Whale or Seal Oil.

59. To the person who shall invent and discover to the Society an effectual method of purifying Whale or Seal Oil from the glutinous matter that incrusts the wicks of lamps, and extinguishes the light, though fully supplied with oil; provided that such purified oil resists congelation in an equal degree with the unpurified;—*the Gold Medal*, or *Fifty Guineas.*

It is required that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society to determine the validity of the claim; and certificates that not less than twenty gallons have been purified according to the process delivered in, together with two gallons of the oil in its unpurified state, and two gallons so refined, to be produced to the Society on or before the second Tuesday in February, 1824.

Oil for Chronometers.

60. To the person who shall invent and discover to the Society a method, verified by actual experiment, of rendering oil more fit than any now in use for chronometers and watches, particularly in being less liable to become thick or rancid;—*the Gold Medal*, or *Fifty Guineas.*

A full account of the experiments and of the process or processes employed, verified by satisfactory certificates, together with a specimen of the oil, to be produced to the Society on or before the last Tuesday in March, 1824.

Crown Glass.

61. To the person who shall make Crown or Window Glass equally transparent, and as free from blue and green colour as the best German sheet;—*the Gold Vulcan Medal*, or *Thirty Guineas.*

Certificates that not less than two cwt. has been made, together with one whole plate and two of the largest squares that can be cut, and a full account of the proportions of the ingredients, and of the process of manufacture, to be produced to the Society on or before the last Tuesday in February, 1824.

Flint Glass.

62. To the person who shall make flint glass free from veins, and as dense and transparent as the best now in use, and quite fit for the purposes of Opticians;—*the Gold Medal*, or *Thirty Guineas.*

A full account of the process, with certificates that not less than two cwt. has been made, together with 20lbs. in plates not less than six inches wide, and three quarters of an inch thick, to be produced to the Society, on or before the last Tuesday in January, 1824.

Indelible Ink.

63. To the person who shall discover to the Society a method of making a Black Ink proper for writing, superior to any at present known, indestructible by chemical applications, and not too dear for common use;—*the Silver Medal*, or *Fifteen Guineas.*

Certificates that not less than two gallons of such ink have been actually prepared, and found to possess the qualities above-mentioned, with a full detail of the process of making it, and two quarts of the ink, to be delivered to the Society on or before the second Tuesday in February, 1824.

Printers' Ink.

64. To the person who shall invent and discover to the Society the best composition for Printers' Ink, superior to any hitherto known or in use;—*the Gold Medal*, or *Thirty Guineas.*

Certificates that 112lbs, of such ink have been made, with a full account of the process employed, and 6lbs. of the ink, to be produced to the Society on or before the last Tuesday in February, 1824.

Copper Plate Printers' Ink.

65. To the person who shall invent and discover to the Society the best composition for Printers' ink, superior to any hitherto known or in use, and fit for the finest kind of copper-plate printing;—*the Gold Medal*, or *Thirty Guineas.*

Certificates and conditions the same as for the last premium.

Rendering Leather Water-proof.

66. To the person who shall discover a method, superior to any now in use, and of moderate price, of rendering Leather Water-proof, without injuring its texture or pliability;—*the Silver Medal*, or *Fifteen Guineas.*

A full account of the process, and of the ingredients employed, together with their proportions, attested by satisfactory certificates, as well as samples of the leather in its unprepared and prepared state, to be produced to the Society on or before the last Tuesday in February, 1824.

Preserving Seeds of Vegetables.

67. For the best method of preserving Seeds of Plants in a state fit for vegetation a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the last Tuesday in December, 1824;—*the Gold Medal*, or *Thirty Guineas.*

Preserving Provisions from becoming rancid or rusty.

68. To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving Salted Provisions from becoming rancid or rusty;—*the Gold Medal*, or *Thirty Guineas.*

A full description of the method, with proper certificates that it has been found, on repeated trials, to answer the purpose intended, to be produced to the Society on or before the last Tuesday in February, 1824.

Preserving Iron from Rust.

69. To the person who shall invent and discover to the Society a cheap composition superior to any now in use, which shall effectually preserve Wrought Iron from rust;—*the Gold Medal*, or *Fifty Guineas.*

A full description of the method of preparing the composition, with certificates that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with ten pounds weight of the composition, on or before the last Tuesday in January, 1824.

Preventing the Dry-rot in Timber.

70. To the person who shall discover to the Society a certain method of preventing the Dry-rot in Timber, superior to any hitherto known;—*the Gold Medal*, or *Thirty Guineas.*

The particulars of the method of prevention, confirmed by repeated experiments, to be produced to the Society on or before the last Tuesday in February, 1824.

Preventing the Mildew in Paper.

71. To the person who shall communicate to the Society a process to be used in the manufacture of paper, or some application to be made to manufactured paper, which shall effectually prevent it from becoming mildewed; — *the Gold Medal*, or *Thirty Guineas.*

A full account of the process employed, with certificates and other evidence of its efficacy, to be communicated to the Society on or before the last Tuesday in March, 1824.

This premium is continued one year further on the same conditions.

Preventing the Destructive Effects from Moths.

72. To the person who shall discover to the Society a cheap, easy, and effectual method, verified by repeated and satisfactory trials, of preventing the destructive effects occasioned by Moths and other insects, in furs, woollens, and other articles, superior to any hitherto known or practised;—*the Gold Medal*, or *Thirty Guineas.*

The accounts, with proper certificates, to be produced to the Society on or before the first Tuesday in January, 1824.

Substitute for Lead Pipes.

73. To the person who shall invent and produce to the Society, a substitute for the Lead Pipes used for conveying malt and other liquors from the cellars to the bars of public-houses, superior to any other metal-pipes now in use;—*the Gold Medal*, or *Fifty Guineas.*

The substance of which the pipe is made must be free from any poisonous or noxious quality, equally durable as lead, and of a moderate expense; and a specimen thereof, not less than ten yards in length, with a complete description of the process employed in forming it, must be produced to the Society on or before the last Tuesday in February, 1824.

Substitute for the Basis of White Paint.

74. To the person who shall produce to the Society the best substitute, superior to any hitherto known, for the basis of white paint, equally proper for the purpose as the white lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white-lead;—*the Gold Medal*, or *One Hundred Guineas.*

A quantity of the substitute, not less than 25lbs. weight, with an account of the process used in preparing it, and certificates that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in February, 1824.

Substitute for Tar.

75. To the person who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind, and prepared from materials the produce of the United Kingdom, or its colonies;—*the Gold Medal*, or *One Hundred Guineas.*

A quantity of the substitute, not less than one hundred weight, with certificates that at least one ton has been manufactured, and that it can be afforded at a price not exceeding that of the best foreign tar, together with an account of the process, to be delivered to the Society on or before the first Tuesday in March, 1824.

N. B. Tar is produced in Sweden and Norway from the roots of fir-trees burnt for that purpose.

Dyeing Silk of a Pink or Rose Colour.

76. To the person who shall invent and discover to the Society, a process of dying Rose and Pink colours in Silks, without the use of Safflower, by a substitute of British or colonial growth, which shall produce a colour equally beautiful and permanent, and at an expense not more than two-thirds of the current price;—*the Gold Medal*, or *Thirty Guineas.*

The communication, with a full account of the processes employed, and certificates that the required conditions are accomplished, to be produced to the Society on or before the last Tuesday in March, 1824.

Improved Black Dye for Silk or Wool.

77. To the person who shall invent and discover to the Society a black dye for silk or wool superior in colour and durability to any at present in use;—*the Gold Medal*, or *Fifty Guineas*.

This premium is more immediately intended for the improvement of those colours known by the name of blue blacks.

A full account of the process and ingredients employed, together with their proportions, attested by satisfactory certificates, as well as samples of the silk or wool so dyed, to be produced to the Society, on or before the last Tuesday in March, 1824.

Dyeing with Lac Lake.

78. To the person who shall invent and discover to the Society a process for dyeing silk, wool, or cotton with lac lake, superior to any now in use;—*the Gold Medal*, or *Thirty Guineas*.

A full account of the process, with certificates that it has been found to answer completely in use, and specimens of articles so dyed, to be produced to the Society on or before the last Tuesday in March, 1824.

Preparation of a Red Stain for Cotton Cloth.

79. To the person who shall communicate to the Society the most effectual method of printing or staining cotton cloth with a red colour, by an immediate application of the colouring matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder;—*the Gold Medal*, or *Fifty Guineas*.

Certificates that the process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length; one piece of the calico so printed, one pound of the colour, and a full account of the preparation and application thereof, to be produced to the Society on or before the second Tuesday in February, 1824.

Preparation of a Green Colour for printing Cotton Cloth.

80. To the person who shall communicate to the Society the best method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld, and the solutions of indigo;—*the Gold Medal*, or *Fifty Guineas*.

Certificates and conditions as for Premium 79.

Permanent White Paint for the Use of Artists.

81. To the person who shall produce to the Society a White Paint for oil, superior to any hitherto known, and not liable to be discoloured by exposure to light or to sulphuretted hydrogen gas;—*the Gold Medal*, or *Thirty Guineas*.

A full account of the process, and 1 lb. of the colour to be produced to the Society, on or before the second Tuesday in February, 1824.

Red Pigment.

82. To the person who shall discover to the Society a full and satisfactory process for preparing a Red Pigment, fit for use in oil or water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable; —*the Gold Medal*, or *Fifty Guineas*.

One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1824.

N. B. It is required, that the colour should remain unaltered by common exposure to strong light, damps, and noxious vapours.

Ultramarine.

83. To the person who shall prepare an artificial Ultramarine, equal in colour, brilliancy, and durability, to the best prepared from lapis lazuli, and which may be afforded at a cheaper rate;—*the Gold Medal*, or *Thirty Guineas*.

The conditions are the same as in the preceding premium for the red pigment.

Colourless Lac Varnish.

84. To the person who shall produce to the Society a varnish made from shell or seed lac, equally hard and as fit for use in the arts as that at present prepared from the above substances, but deprived of its colouring matter;—*the Gold Medal*, or *Thirty Guineas.*

A full account of the process, and one quart of the varnish to be produced to the Society on or before the second Tuesday in January, 1824.

Statuary Marble.

85. To the person who shall discover within Great Britain or Ireland, a quarry of White Marble fit for the purposes of statuary, and equal to those kinds now imported from Italy;—*the Gold Medal*, or *One Hundred Guineas.*

A block of at least three feet in length, two in height, and two in width, with an account of the situation of the quarry, and certificates of its possessing considerable extent, to be produced to the Society on or before the first Tuesday in February, 1824.

N. B. In order to prevent useless expense or trouble to the claimant in forwarding so large a block, the Society will be ready to examine any smaller specimen of the marble, and will express their opinion of its value to the Candidate before the block required by the above premium is produced.

Stone for Lithography.

86. To the person who shall discover within Great Britain or Ireland, a quarry of Stone fit for the purposes of Lithography, equal at least to the stones imported from abroad; *the Gold Isis Medal*, or *Thirty Guineas.*

A specimen of the stone at least two feet square and two inches in thickness, with an account of the situation of the quarry, and certificates of its possessing considerable extent, to be produced to the Society on or before the last Tuesday in February, 1824.

Mineralogical and Geological County Maps.

87. To the person who shall complete and publish the best Mineralogical and Geological Map of any county in the United Kingdom, on a scale of not less than one inch to a mile, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced, with sections of the strata;—*the Gold Medal*, or *Fifty Guineas.*

The map, with certificates of its accuracy, to be produced to the Society on or before the first Tuesday in February 1824. One impression of the map to remain the property of the Society.

Mineralogical and Geological Map of Ireland.

88. To the person who shall complete and publish an accurate Mineralogical and Geological Map of Ireland, on a scale of not less than five miles to an inch, containing particulars described in the foregoing premium;—*the Gold Medal*, or *Fifty Guineas.*

The conditions are the same as in the preceding.

Mineralogical and Geological Map of Scotland.

89. The same premium is offered for a Mineralogical and Geological Map of Scotland, on similar conditions.

Natural History.

90. To the author who shall publish the Natural History of any county in the United Kingdom;—*the Gold Medal*, or *Fifty Guineas.*

It is required that the several natural productions, animal, vegetable, and mineral, peculiar to the county, or found therein, be carefully and scientifically arranged and described, in order that the public may be enabled to judge what arts or manufactures are most likely to succeed in such county. A copy of the work to be delivered to the Society on or before the last Tuesday in February 1824, to remain the property of the Society.

PREMIUMS IN POLITE ARTS.

HONORARY PREMIUMS FOR NOBILITY.

To GENTLEMEN *under the Age of Twenty-five, Sons or Grandsons of Peers or of Peeresses in their own right of the United Kingdom.*

91. For the best original painting or drawing of an historical subject;—*the Gold Medal;* for the next in merit, *the Gold Isis Medal.*

92. For the best copy of an historical subject;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

93. For the best original painting or drawing of a portrait;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

94. For the best copy of a portrait; —*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

95. For the best original painting or drawing of a landscape;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

96. For the best copy of a landscape; —*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

97. For the best original painting of flowers or fruit;—*the Gold Isis Medal;* for the next in merit; *the Silver Medal.*

98. For the best copy of fruit or flowers;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

99. For the best original Painting of still-life;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

100. For the best copy of still life;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

To LADIES *under the Age of Twenty-five, Daughters or Grand-daughters of Peers or of Peersesses in their own right of the United Kingdom.*

101. For the best original painting or drawing of an historical subject;—*the Gold Medal;* for the next in merit, *the Gold Isis Medal.*

102. For the best copy of an historical subject;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

103. For the best original painting or drawing of a portrait;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

104. For the best copy of a portrait;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

105. For the best original painting or drawing of a landscape;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

106. For the best copy of a landscape; —*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

107. For the best original painting of flowers or fruit;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

108. For the best copy of flowers or fruit;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

109. For the best original painting of still-life;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

110. For the best copy of still-life;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

HONORARY PREMIUMS FOR GENTLEMEN AND LADIES.

To GENTLEMEN *under the Age of Eighteen.*

111. For the best drawing in chalk, pencil, or Indian Ink, being a copy from any picture, print, or drawing of a head or figure;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

To GENTLEMEN *under the Age of Twenty.*

112. For the best drawing in chalk, pencil, or Indian ink, from a bust;—*the*

Silver Medal; for the next in merit, *the Silver Isis Medal.*

To Gentlemen *under the Age of Twenty-one.*

Drawings and Paintings in Water Colours.

113. For the best drawing in chalk, pencil, or Indian ink, from a statue or cast in plaster, of an entire figure;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

114. For the best drawing in pencil, Indian ink, or chalk, of an historical subject, being a copy;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

115. For the best painting in water-colours, of an historical subject, being a copy;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

116. For the best drawing in pencil, Indian ink, or chalk, of a portrait, being a copy;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

117. For the best painting in water-colours of a portrait, being a copy;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

118. For the best drawing in pencil, Indian ink, or chalk, of a landscape, being a copy;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

119. For the best painting in water-colours of a landscape, being a copy;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

120. For the best painting in water-colours of flowers or fruit, being a copy;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

Paintings in Oil.

121. For the best copy in oil colours of an historical subject; — *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

122. For the best copy in oil colours of a portrait;—*the Silver Medal*; for the next in merit, *the Silver Isis Medal.*

123. For the best copy in oil colours of a landscape;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

124. For the best copy in oil colours of flowers or fruit;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

To Gentlemen *under the Age of Twenty-five.*

Drawings and Paintings in Water Colours.

125. For the best original painting in water-colours of an historical subject;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

126. For the best original painting in water-colours of a portrait, being a miniature;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

127. For the best original painting in water-colours of a landscape;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

128. For the best original painting in water-colours of flowers or fruit; — *the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

129. For the best original painting in water-colours of still-life; — *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

Paintings in Oil.

130. For the best original painting in oil colours of an historical subject, consisting of not less than three figures;—*the Gold Medal;* for the next in merit, *the Gold Isis Medal.*

131. For the best original painting in oil colours of a portrait; — *the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

132. For the best original painting in oil colours of a landscape;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

133. For the best original painting in oil colours of flowers or fruit;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

134. For the best original painting in oil colours of still-life; — *the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

To Ladies *under the Age of Eighteen.*

135. For the best drawing in pencil, Indian ink, or chalk, being a copy, from any picture, print, or drawing, of a head or figure;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

To LADIES *under the Age of Twenty.*

136. For the best drawing in pencil, Indian ink, or chalk, from a bust; — *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

To LADIES *under the Age of Twenty-one.*

Drawings and Paintings in Water Colours.

137. For the best drawing in pencil, Indian ink, or chalk, from a statue or cast in plaster, of an entire figure;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

138. For the best drawing in pencil, Indian ink, or chalk, being a copy, of an historical subject;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

139. For the best painting in water-colours, being a copy, of an historical subject;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

140. For the best drawing in pencil, Indian ink, or chalk, being a copy, of a portrait;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

141. For the best painting in water-colours of a portrait, being a copy, *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

142. For the best drawing in pencil, Indian ink, or chalk, of a landscape, being a copy; *the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

142*. For the best painting in water-colours of a landscape, being a copy;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

143. For the best painting in water-colours, being a copy, of fruit or flowers; —*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

Paintings in Oil.

144. For the best copy in oil colours of an historical subject; — *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

145. For the best copy in oil colours of a portrait;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

146. For the best copy in oil colours of a landscape;— *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

147. For the best copy in oil colours of fruit or flowers;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

To LADIES *under the Age of Twenty-five.*

Drawings and Paintings in Water Colours.

148. For the best original painting in water-colours of an historical subject;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

149. For the best painting of a portrait in water-colours, being a miniature; —*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

150. For the best original painting in water-colours of a landscape;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

151. For the best original painting in water-colours of fruit or flowers; — *the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

152. For the best original painting in water-colours of still-life; — *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

Paintings in Oil.

153. For the best original painting in oil colours of an historical subject, consisting of not less than three figures;—*the Gold Medal;* for the next in merit, *the Gold Isis Medal.*

154. For the best original painting in oil colours of a portrait; —*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

155. For the best original painting in oil colours of a landscape; —*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

156. For the best original painting in oil colours of fruit or flowers;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

157. For the best original painting in oil colours of still-life; —*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

N. B. As the foregoing honorary premiums are intended only for the nobility and gentry; persons professing any branch of the polite arts, or any business dependent on the arts of design, or the sons and daughters of such persons, will not be admitted candidates in the above classes.

PREMIUMS FOR ARTISTS AND OTHERS.

Human Figure.

158. For the best drawing in chalk, pencil, or Indian ink, copied from any picture, print, or drawing, by persons under the age of sixteen;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

159. For the best outline, drawn from any entire figure of the antique, or cast in plaster—the size of the drawing to be not less than twenty-four inches, to be accompanied with the drawing of a hand and foot the size of life—by persons under the age of eighteen; — *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

160. For the best drawing from any entire antique figure, or from any cast in plaster—the size of the drawing to be not less than twenty-four inches, to be accompanied with a drawing of a hand and foot, the size of life, by persons under the age of nineteen;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

161. For the best outline drawing of an entire anatomical human figure, from a model or cast—the size of the drawing to be not less than twenty-four inches, to be accompanied with a drawing of a hand and foot, the size of life, by persons under the age of nineteen; — *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

162. For the best drawing, from the living figure—the size of the drawing to be not less than twenty-four inches, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

163. For the best copy in water-colours from any picture, being a composition of two or more figures, the size of the principal figure not less than nine inches, by persons under the age of twenty-one; —*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

164. For the best original drawing, being a composition of two or more figures, the principal figure not less than nine inches, by persons under the age of twenty-five; — *the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

165. For the best copy in oil from any picture, being a composition of two or more figures, the principal figure not less than twenty-four inches, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

166. For the best original painting in oil, being an historical composition, of not less than three figures, the principal figure not less than twenty-four inches high, and the size of the canvas to be a common half length (or three feet four inches by four feet two inches); the subject to be taken from English history previous to the reign of Charles the First, by persons under the age of twenty-five; —*the Gold Medal;* for the next in merit, *the Gold Isis Medal.*

167. For the best original painting in oil, being a composition of two or more figures, the principal figure not less than twenty-four inches, by persons under the age of twenty-five;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

Heads or Portraits.

168. For the best drawing of a head, copied from any picture, drawing, or print, by persons under the age of sixteen;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

169. For the best finished drawing of a head, not less than the size of life, from any bust, by persons under the age of eighteen;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

170. For the best painting in oil, of a group, of not less than three heads, from the antique, the size of the canvas to be a kit-cat, by persons under the age of nineteen;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

171. For the best original painting in water-colours of a portrait, or group of portraits, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

172. For the best portrait in miniature, in water-colours, being a copy, by persons under the age of twenty;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

173. For the best original portrait in miniature, in water-colours, by persons

under the age of twenty-five;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

174. For the best copy, in oil, of a portrait, by persons under the age of nineteen; — *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

175. For the best original painting in oil of a portrait, by persons under the age of twenty-three; — *the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

Models.

176. For the best model in bass-relief, from any entire antique figure, or cast in plaster, the size of the model not less than twenty-four inches, by persons under the age of eighteen;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

177. For the best model in bass-relief from the living figure, by persons under the age of twenty-one, the model not less than twenty-four inches;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

178. For the best model of a bust from the antique, of a different size from the original, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

179. For the best model of a bust from nature, of the size of life, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

180. For the best model in the round from an entire antique figure, the model not less than twenty-four inches high, by persons under the age of twenty-one; —*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

181. For the best original model of a group, the figures not less than twenty-four inches, by persons under the age of twenty-five; — *the Gold Medal;* for the next in merit, *the Gold Isis Medal.*

182. For the best coloured anatomical model of a dissected limb, or other part of the human body, natural or morbid, in wax or other substance; — *the Gold Medal.*

Landscape.

183. For the best drawing of a landscape, copied from any picture, drawing, or print, by persons under the age of eighteen;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

184. For the best original drawing of a landscape from nature, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

185. For the best original oil painting of a landscape from nature, by persons under the age of twenty-three;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

186. For the best original composition of a landscape painted in oil, by persons under the age of twenty-five;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

187. For the best original marine painting, in oil, of two or more vessels, by persons under the age of twenty-five; —*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

Flowers, or Fruit.

188. For the best painting in water-colours, by persons under the age of sixteen; — *the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

189. For the best original composition in water-colours from nature, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

190. For the best original composition in oil, painted from nature, by persons under the age of twenty-five;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

Animals.

191. For the best drawing of any animal, copied from any picture, print, or drawing, by persons under the age of sixteen;—*the Silver Isis Medal;* for the next in merit, *the Silver Palette.*

192. For the best original drawing from nature of any animal, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

193. For the best original painting in oil, of a group of not less than three animals painted from nature, by persons under the age of twenty-five;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

Still-Life.

194. For the best original composition, painted in oil or water-colours, of three or more of such subjects as are usually called Still-Life, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

Vignette.

195. For the best design for a vignette to be printed at the head of the Society's letters, &c.;—*the Gold Isis Medal.*—The design to remain the property of the Society.

Architecture.

196. For the best perspective drawing of a Corinthian capital, not less than eighteen inches high, by persons under twenty-one years of age; — *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

197. For the best original design of a bridge, adapted to the purposes and site of London-bridge, consisting of plan, elevation, section, and perspective view, to the scale of 1-16th of an inch to a foot; the drawing to remain the property of the Society, if required, by persons under the age of thirty;—*the Gold Medallion;* for the next in merit, *the Gold Isis Medal.*

Designs that have been previously exhibited, are excluded from competition for the above premium.

The following inscription to be engraved on the medallion: "*The Premium given by the Society for the encouragement of Arts, Manufactures, and Commerce, in conformity to the will of John Stock, esq. of Hampstead.*"

198. For the best design for a church of pure Doric architecture;—*the Gold Medallion;* for the next in merit, *the Silver Medal.*

It is recommended that the building resemble a Grecian Temple as nearly as its adaptation to the purposes of a church will permit. The drawings sent in for this premium to consist of one or more plans, elevations, and perspective views, with separate representations of such parts as may be necessary to give a complete explanation of the design. The drawings to be made on a scale of ⅛ of an inch to a foot and the particular parts on a larger scale, if necessary. The claims for this premium to be sent in to the Society on or before the third Tuesday in January, 1825.

The object of the Society in offering this premium, is to promote the erection of such public buildings as would be an honour to the country.

199. For the best design in Greek architecture of an uniform building, fit for three or more dwelling houses, and adapted to the streets or squares of the Metropolis, to consist of plan, elevation, and perspective view, on a scale of ⅛ of an inch to a foot, by persons under the age of thirty; *the Gold Isis Medal.*

Perspective.

200. For the best perspective drawing from any public building in the United Kingdom, from elevations taken by actual measurement, and projected according to rule, drawn on large elephant paper, by persons under the age of twenty-one; —*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

201. For the best perspective drawing of machinery, by persons under the age of twenty-one, *the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

Enamel Painting.

202. For the best enamel painting of a head, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

203. For the best historical painting in enamel, by persons under the age of twenty-five; — *the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

Carving in Wood.

204. For the best carving in Wood of fruit, or flowers, not less than nine inches high, by persons under the age of twenty-one;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

205. For the best carving in Wood, of one or more animals, the size of the animal not less than eight inches, by persons under the age of twenty-three;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

206. For the best carving in Wood, of one or more human figures, not less than a foot in height, by persons under the age of twenty-five;—*The Gold Isis Medal;* for the next in merit, *the Silver Medal.*

Etching.

207. For the best free Etching in historical composition, from a picture of eminence, by persons under the age of twenty-five;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

208. For the best free Etching of a landscape, from a picture of eminence, by persons under the age of twenty-five; —*the Silver Medal;* for thenext in merit, *the Silver Isis Medal.*

Finished Engravings, on Steel, or Copper.

209. For the best finished Engraving in historical composition, by persons under the age of thirty;—*the Gold Medal;* for the next in merit, *the Gold Isis Medal.*

210. For the best finished Engraving of a landscape, by persons under the age of thirty;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

211. For the best finished Engraving of a portrait, by persons under the age of thirty;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

212. For the best finished Engraving of a portrait in Mezzotinto, by persons under the age of thirty;—*the Silver Medal.*

N. B.—In the class of finished engravings the Society requires an aquafortis impression, and a finished proof, to be sent, and to remain with the Society.

Engraving on Blocks.

213. For the best Engraving on Wood Blocks, of an historical subject, the size of the principal figure not less than six inches in height, and the Block to be at least twelve inches by nine;—*the Gold Isis Medal.*

Two or more impressions, with the Block, to be produced to the Society. The impressions, but not the block, to remain the property of the Society.

214. The same premium under the same conditions, is offered for engraving on Metal Blocks.

Lithography.

215. For the best specimen in this art;—*the Silver Medal.*

A particular account of the process employed, with six impressions of the drawing, to be produced to the Society.

216. For the best method of transferring drawings from the paper to the stone, for the purpose of Lithography, superior to any hitherto in use—*the Silver Medal,* or *Twenty Guineas.*

A complete account of the process employed, with specimens of the materials, to be produced to the Society on or before the first Tuesday in March, 1824.—Two specimens of the impression to remain with the Society.

Medal Die Engravings.

217. For the best die Engraving either of a head or single figure, after the engraver's own design and model; by persons under the age of 21;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

218. For the best die engraving of a group, after the Engravers own design and model, by persons under the age of thirty;—*the Gold Medal,* for the next in merit, *the Gold Isis Medal.*

The Dies, with two impressions or casts, and the model, in each claim for Medal Die sinking, are to be produced to the Society, and the impressions or casts to remain the property of the Society.

219. To the person who shall discover and communicate to the Society a method of hardening Medal Dies, superior to any hitherto known, and which shall completely prevent the surface of the die from being cracked, scaled, warped, or otherwise injured;—*the Gold Medal,* or *Thirty Guineas.*

A full detailed account of all the processes required to produce the effect, with certificates of their successful application, to be delivered so the Society on or before the first Tuesday in March, 1824.

Gem Engraving.

220. For the best engraving in intaglio, of a head or single figure on carnelian or other hard stone, being a copy;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

221. For the best engraving in intaglio of a head or figure, after the engraver's own design and model, on carnelian or other hard stone;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

222. For the best engraving in intaglio of a group, after the engraver's own design and model, on carnelian or other hard stone;—*the Gold Medal;* for the next in merit, *the Gold Isis Medal.*

223. For the best engraving in cameo, of a head or single figure in carnelian, or other hard stone, being a copy;—*the Silver Medal;* for the next in merit, *the Silver Isis Medal.*

224. For the best engraving in cameo of a head or figure, after the engraver's own design and model, on carnelian or other hard stone;—*the Gold Isis Medal;* for the next in merit, *the Silver Medal.*

225. For the best engraving in cameo of a group, after the engraver's own design and model, on carnelian or other hard stone;—*the Gold Medal;* for the next in merit, *the Gold Isis Medal.*

Premium for Medical or Surgical Students.

226. For the best Original Drawing (made from actual dissection), of the anatomy of the human body, or of any part thereof, sufficiently free and accurate for the purposes of Surgery; such drawing to be not less than the natural size of the parts; by persons under the age of twenty-two;—*the Silver Medal,* for the next in merit, *the Silver Isis Medal.*

It is required that each drawing be accompanied by an outline, with the necessary references to render the Drawing intelligible.

Conditions for the Polite Arts.

All performances in the class of Polite Arts, are to be produced to the Society on or before the first Tuesday in March, 1824, and none can be received after that day.

No Candidate, under any pretence whatever, shall be allowed to retouch or varnish a performance after it has been received by the Society.

No Candidate having received a premium or bounty, shall receive an equal reward in the same class, or an inferior reward, in any class of the same department of art.

No more than one performance in each class shall be received from the same Candidate.

All performances to which premiums or bounties are adjudged, shall remain with the Society until after the second Wednesday in June, 1824, when they will be re-delivered, unless mentioned in the premiums to the contrary,

No performance shall be admitted, that has obtained a reward from any other society, or academy.

All performances must have been executed within the year previous to their being sent in to the Society.

No performance can be received which does not come into one of the foregoing classes, and which does not agree with the conditions of the class in which it is introduced, except by a particular recommendation from the committee, and confirmed by the Society, that it is deserving of being made an exception to the general rule, and in such case a bounty may be given.

It is required, that the subjects for which premiums are offered, be delivered in without the names, or any external intimation to whom they belong; that the Candidate affix on the front of his performance whatever mark he pleases, and that the same mark be inscribed on the outside of a paper sealed up, containing within, the name and residence of the Candidate, and *on the outside*, the sex, and age, as being under respectively 16, 20, or 25 years, and the number of the premium in claim of which the performance is offered, and whether the Candidate has previously received from the Society any and what reward; the name not to be disclosed unless the Candidate be successful, or in consequence of a special vote of the Society, or Committee.

To encourage real merit, and to prevent attempts to impose on the Society, by producing drawings made or retouched by any other person than the Candidate, the Society require a specimen of the abilities of each successful Candidate to be made under the inspection of the Committee of Polite Arts.

All Candidates in the Polite Arts, are required to signify on their drawings, whether the performances are originals or copies; and if possible to send the originals from which the copies are taken.

All copies of prints and drawings, are to be on a different scale from the original.

The Society reserve to themselves the power of giving medals of less value than those proposed; or of withholding them altogether in cases where the performance shall be deemed undeserving of reward. But if there should be in the same class more than two works of merit, deserving encouragement, the Committee is allowed to recommend at the same time to the Society, that a bounty be given; and in case of the second premium offered being the lowest reward which the Society gives, such lowest reward may be repeated as a bounty.

In consideration of the great number of premiums here offered, embracing so many departments of the Fine Arts, no bounty can be given, except in such cases as are mentioned in the preceding conditions.

PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

British Merino Wool.

227. To the person who shall prove to the Society, that he has sold the largest quantity of Merino Wool, or such Wool as will answer the same purpose, being the produce of his own flock, in the United Kingdom, for the purpose of being manufactured into superfine cloth, the quantity of Wool not less than five hundred weight, in the year 1823;—*the Gold Medal.*

Certificates, along with samples of the wool, and of the cloth manufactured from it, to be produced to the Society, on or before the last Tuesday in March, 1824.

228. For the next greatest quantity, not less than two hundred and fifty pounds;—*the Silver Medal*, on similar conditions.

Wicks for Candles.

229. To the person who shall make known to the Society the most satisfactory result of a series of experiments actually made by him to determine the best thickness of Cotton Wicks for Candles, so as to obviate the defects of those commonly used;—*the Silver Medal*, or *Ten Guineas.*

Certificates, that not less than one hundred weight have been so made, and six pounds of the Candles, to be produced to the Society, on or before the last Tuesday in February, 1824.

N. B. The intention in offering this premium is, to ascertain the proper thickness or bulk of the wick in proportion to that of the tallow, and to remove the unpleasant consequences and waste arising from the sparkling, or guttering of the candles in common use.

Transparent Paper.

230. To the person who shall discover to the Society a method of making Paper from the pulp, that shall be perfectly transparent, and that shall take and bear common writing-ink with the same facility and correctness as writing-paper, generally in use;—*the Silver Medal*, or *Twenty Guineas.*

Certificates of the making such paper an account of the process, and one ream of the paper, to be produced to the Society, on or before the second Tuesday in March, 1824.

[China Paper, see premium 293.]

Leather for Gloves.

231. To the person who shall make known to the Society a process equal or superior to that of the French, for preparing, dyeing, and finishing skins for fine gloves, verified by actual experiment, and the communication accompanied with at least a dozen pair of gloves made from skins so prepared;—*the Gold Medal*, or *Forty Guineas.*

Certificates from competent persons fully approving of the result of such experiments, together with the gloves and, communication, to be produced to the Society, on or before the last Tuesday in March, 1824.

Catgut.

232. To the person who shall discover to the Society the best method of manufacturing, the intestines of sheep, lambs, goats, or of any other animals, into the article called Cat-gut, equally strong, clear, smooth, even, and free from knots, as the best Italian strings, and at a price not exceeding what they are usually sold for in England;—*the Gold Medal*, or *Thirty Guineas.*

Certificates that not less than fifty pound weight have been so prepared by the claimant, with a full detail of the process, and samples of the articles of various thicknesses, to be produced to the Society on or before the first Tuesday in February, 1824.

233. For the next greatest quantity, not less than twenty-five pounds;—*the Silver Medal*, or *Twenty Guineas*, on similar conditions.

Hose for Fire Engines, Brewhouses, &c.

234. To the person who shall invent and make known to the Society, a method of making Hose for Fire Engines, Brewhouses, &c. similar to those used on the continent, made of flax or hemp, or other flexible material cheaper than leather;—*The Gold Isis Medal*, or *Thirty Guineas*.

A full account of the process used in manufacturing it, with certificates of its efficacy in practice, to be produced to the Society on or before the last Tuesday in February, 1824.

Thread for Lace.

235. To the person who shall invent and discover to the Society a method of manufacturing Thread from flax, of as fine quality as any used on the Continent;—*the Gold Medal*, or *Thirty Guineas*.

Samples of the Thread, not less than one pound in weight, and of the Lace made therefrom, together with certificates that not less than ten pounds in weight of each sort has been manufactured, to be produced to the Society on or before the last Tuesday in March, 1824.

Shawls of Cachemire Wool.

236. To the person who shall invent and produce to the Society the best imitation of Indian Shawls, made from real Cachemire Wool, without any mixture of silk or other article;—*the Gold Medal*, or *Thirty Guineas*.

Certificates from competent persons approving the articles manufactured, with a full account of the process employed therein, to be produced to the Society on or before the last Tuesday in March, 1824.

Cloth from New South Wales Wool.

237. To the person who shall manufacture the finest specimen, at a fair market price, of Cloth from wool imported from New South Wales, not less than 35 yards, without any admixture of other wool;—*the Gold Isis Medal*.

Certificates from competent persons approving of the article so manufactured, with a full account of the process employed therein, and of any peculiar qualities discoverable in the process of manufacturing, to be produced to the Society on or before the last Tuesday in February, 1824.

Organzine Silk.

238. To the person who shall invent and produce to the Society a method by which to organzine silk equal in quality to the Italian throw, at an expense not more than two-thirds of the current price of throwing;—*the Gold Medal*, or *Fifty Guineas*.

The communication, with a full description of the process, and models or drawings of the apparatus employed, and samples of the produce, with certificates of the invention answering the required conditions, to be produced to the Society on or before the second Tuesday in March, 1824.

Machine for Silk Weaving.

239. To the person who shall invent and produce to the Society a Machine to weave figured silks, for garments, shawls, handkerchiefs, &c. of patterns equally fine and rich as those now made in France, at less expense than the montures, &c. now in use, also affording greater facility for changing the pattern, and requiring less manual labour in working;—*the Gold Medal*, or *Fifty Guineas*.

Certificates of the performance of the Machine, and a model of the same, to be produced to the Society on or before the last Tuesday in March, 1824.

Preventing the Watering of Plain Silks.

240. To the person who shall invent a method of preventing Plain Silks from

being watered in the loom, without the use of a knee-roll;—*the Silver Medal*, or *Fifteen Guineas.*

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the last Tuesday in March, 1824.

Weaving Ribbons in the Single Hand Loom.

duce the best substitute for the plan now used in the Single-Hand Loom, namely, High-lashes and Pass-cords;—*the Gold Isis Medal*, or *Twenty Guineas.*

The improved plan to be capable of producing ribbons equal in texture to those of French manufacture, and to perform well in every respect. The entire height of the Loom and its appendages not to exceed eight feet. The communication, together with Specimens of ribbons made with the improved Loom, to be produced

and produce to the Society, a Mill for Grinding Corn for the use of private families, or parish poor; the construction to be simple, the mill to be easily worked, and superior to any hitherto in use;—*the Gold Medal*, or *Thirty Guineas.*

The Mill, and certificates of its having been used to good effect, to be produced to the Society on or before the last Tuesday in February, 1824. Cheapness and simplicity will be considered as essential parts of its merit; and the Mill, or a model, to remain with the Society.

to be raised [illegible], *Medal*, or *Thirty Guineas.*

A model, with a certificate tha machine at large has been employe good effect, to be produced to the Soc. on or before the second Tuesday March, 1824.

Machine for Raising Water.

246. To the person who shall invent a machine on a better, cheaper, and more simple construction than any

the claimant, with a full detail of the process, and samples of the articles of various thicknesses, to be produced to the Society on or before the first Tuesday in February, 1824.

233. For the next greatest quantity, not less than twenty-five pounds;—*the Silver Medal*, or *Twenty Guineas*, on similar conditions.

Cloth from New South Wales Wool.

237. To the person who shall manufacture the finest specimen, at a fair market price, of Cloth from wool imported from New South Wales, not less than 35 yards, without any admixture of other wool;—*the Gold Isis Medal.*

Certificates from competent persons approving of the article so manufactured,

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241.* To the person who shall produce to the Society, on or before the first Tuesday in March 1824, a hat or bonnet, made from indigenous British grass, that shall be equally good in texture and colour as those imported from Leghorn;—*the Silver Medal*, or *Fifteen Guineas.*

241.** To the person who shall produce to the Society, on or before the first Tuesday in March 1824, the largest quantity (not less than fifty score) of plat fit for manufacturing bonnets, equal in texture to those imported from Leghorn, from the New England Grass, seeds of which have been imported and distributed by the Society, raised in Great Britain; — *the Silver Medal*, or *Fifteen Guineas.*

241.*** To the person who shall produce to the Society, on or before the first Tuesday in March 1824, the greatest quantity (not less than six) of hats or bonnets, equal in colour and texture to those imported from Leghorn, manufactured from the New England Grass as above, raised in Great Britain;—*the Silver Medal*, or *Fifteen Guineas.*

241.**** To the person who shall manufacture and produce to the Society, the best specimen of matting, resembling India matting, used for covering rooms, and made from materials grown in Great Britain; — *the Silver Medal*, or *Twenty Guineas.*

Certificates that not less than fifty yards of this matting have been manufactured, and that it will answer the purpose of India matting, and can be afforded at a less price, together with a sample of not less than six yards, and a compleat account of the process of manufacture to be produced to the Society on or before the first Tuesday in March 1824.

241.***** To the person who shall invent and produce to the Society a method, better than any hitherto known, of winding raw silk that is in any degree sticky in its gum, or brittle in its texture, without injuring its colour or texture, or altering its weight, and at a cost not exceeding that of the ordinary methods;—*the Silver Medal*, or *Twenty Guineas.*

A full description of the process and apparatus used, and samples of the silk, both in its wound and raw state, together with certificates of the process having answered the required conditions, to be produced to the Society, on or before the last Tuesday in February 1824.

To face page xxix.

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236. To the person who shall invent and produce to the Society the best imitation of Indian Shawls, made from real Cachemire Wool, without any mixture of silk or other article;—*the Gold Medal*, or *Thirty Guineas.*

Certificates from competent persons approving the articles manufactured, with a full account of the process employed therein, to be produced to the Society on or before the last Tuesday in March, 1824.

working;—*the Gold Medal*, or *Fifty Guineas.*

Certificates of the performance of the Machine, and a model of the same, to be produced to the Society on or before the last Tuesday in March, 1824.

Preventing the Watering of Plain Silks.

240. To the person who shall invent a method of preventing Plain Silks from

being watered in the loom, without the use of a knee-roll;—*the Silver Medal,* or *Fifteen Guineas.*

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the last Tuesday in March, 1824.

Weaving Ribbons in the Single Hand Loom.

241. To the person who shall produce the best substitute for the plan now used in the Single-Hand Loom, namely, High-lashes and Pass-cords;—*the Gold Isis Medal,* or *Twenty Guineas.*

The improved plan to be capable of producing ribbons equal in texture to those of French manufacture, and to perform well in every respect. The entire height of the Loom and its appendages not to exceed eight feet. The communication, together with Specimens of ribbons made with the Improved Loom, to be produced to the Society on or before the first Tuesday in March, 1824.

PREMIUMS IN MECHANICS.

Gunpowder Mills.

242. To the person who shall invent and discover to the Society the most effectual mode of preventing explosions in Gunpowder Mills;—*the Gold Medal,* or *One Hundred Guineas.*

Certificates and accounts of the method having been put in practice in one or more Gunpowder Mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1824.

N. B. As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of Gunpowder-making which fall short of the total prevention of explosion; such bounty or reward will be bestowed on them as they may appear to merit.

Family or Portable Mill.

243. To the person who shall invent and produce to the Society, a mill for Grinding Corn for the use of private families, or parish poor; the construction to be simple, the mill to be easily worked, and superior to any hitherto in use;—*the Gold Medal,* or *Thirty Guineas.*

The Mill, and certificates of its having been used to good effect, to be produced to the Society on or before the last Tuesday in February, 1824. Cheapness and simplicity will be considered as essential parts of its merit; and the Mill, or a model, to remain with the Society.

Machine for Raising Coals, Ore, &c. &c. &c.

244. To the person who shall invent and produce to the Society a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use; and which shall produce the effect at less expense;—*the Gold Medal,* or *Fifty Guineas.*

A model, with a certificate that a machine at large on the same construction has been advantageously used, to be produced to the Society on or before the second Tuesday in February, 1824.

Improved Walking-wheel, or Crane.

245. To the person who shall invent an improved Walking Wheel or Crane, on which the weight or power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or less weight to be raised or lowered;—*the Gold Medal,* or *Thirty Guineas.*

A model, with a certificate that the machine at large has been employed to good effect, to be produced to the Society on or before the second Tuesday in March, 1824.

Machine for Raising Water.

246. To the person who shall invent a machine on a better, cheaper, and more simple construction than any

hitherto known for raising water out of wells, &c. from a depth of not less than fifty feet;—*the Gold Medal*, or *Thirty Guineas.*

Certificates of the performance of the machine, and a model of it, to be produced to the Society on or before the last Tuesday in February, 1824.

Extinguishing Fires.

247. To the person who shall produce to the Society a method for preventing or extinguishing fire in buildings, superior to any now in use;—*the Gold Medal*, or *Thirty Guineas.*

Certificates of the method having been practised with Success, with a full description thereof, to be delivered to the Society on or before the last Tuesday in January, 1824.

This Premium is offered in compliance with a recommendation in the will of the late Dr. Anthony Fothergill.

Boring and Blasting Rocks.

248. To the person who shall discover to the Society a more simple, safe, cheap, and expeditious method than any hitherto known or in use, of Boring or Blasting Rocks in mines, shafts, wells, &c.;—*the Gold Medal*, or *Thirty Guineas.*

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the first Tuesday in February, 1824.

Heating Rooms for the purpose of Manufactures.

249. To the person who shall invent and discover to the Society a method of Heating Rooms, superior to and cheaper than any hitherto known or in use, for the purpose of manufacturers;—*the Gold Medal*, or *Thirty Guineas.*

A model or complete drawing and description of the method, with certificates that it has been successfully practised, to be delivered to the Society on or before the last Tuesday in March, 1824.

Improved Ventilation.

250. To the person who shall invent and produce to the Society a mode of permanently Ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used;—*the Gold Medal*, or *Fifty Guineas.*

A model of the apparatus, and a full account of the means by which the effect has been produced, with proper certificates to be delivered to the Society on or before the last Tuesday in February, 1824.

Ventilating Coal Mines.

251. To the person who shall invent and carry into practice a method of Ventilating Coal Mines so as effectually to prevent the accidents liable to arise from the accumulation of carburetted hydrogen and other gases;—*the Gold Medal*, or *Fifty Guineas.*

A full account of the process, with certificates of its efficacy, to be produced to the Society on or before the last Tuesday in February, 1824.

N. B. The Society will be very glad to attend to any communication, which, though not completely effecting the object, appears to offer an approximation to it. The Society wish particularly to refer candidates for this premium to the communication made by Mr. Ryan, and published in the 34th vol. of the "Transactions," and will consider themselves, obliged to any person who will furnish any information with respect to the attempts which have been made to introduce Mr. Ryan's mode of ventilating coal mines into actual use, and of the success with which this method has been attended.

Preventing Accidents from Stage Coaches.

252. To the person who shall invent and discover to the Society a method of preventing accidents arrising from Stage Coaches;—*the Gold Medal*, or *Thirty Guineas.*

Ample certificates of its efficacy, and a description of the method with models of the machinery used, to be produced to the Society on or before the last Tuesday in February, 1824.

N. B. The Society wish to impress strongly on the public the necessity of turning their attention to the above premium, from the number of accidents that daily occur; and suggest whether they might not, in some degree, be prevented, by an alteration in the manner of placing the luggage.

Preventing Accidents from Horses Falling with Two-Wheeled Carriages.

253. To the person who shall invent and produce to the Society a method, superior to any hitherto known or in use, of preventing accidents from the falling of Horses with two-wheeled Carriages, especially on steep declivities;—*the Gold Medal,* or *Thirty Guineas.*

A model of the apparatus, and a full account of the means by which the effect has been produced, with proper certificates that the same has been used with success, to be delivered to the Society on or before the second Tuesday in February, 1824.

Improving Turnpike and other Roads.

254. To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiment, of combining the materials ordinarily employed in making or repairing Roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat, or any other mode, so as to form an even, hard, and durable carriage-road;—*the Gold Medal,* or *Thirty Guineas.*

It is required that an acccurate account of the method used, and every expense attending it, together with satisfactory certificates of its being effectual, be delivered to the Society on or before the first Tuesday in March, 1824.

Raising the Bodies of Persons who have Sunk under Water.

255. To the person who shall invent and produce to the Society, a cheap and portable Drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water;—*the Gold Medal,* or *Thirty Guineas.*

The drag or machine, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in

Preventing prejudicial effects to the Persons employed in Dry-grinding.

256. To the person who shall invent and produce to the Society a mode of obviating the prejudicial effects that attend the operation of Pointing Needles, and other branches of Dry-grinding, during which the particles of grindstone-dust, steel, and iron, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders;—*the Gold Medal,* or *Thirty Guineas.*

A model of the apparatus, and a full account of the means by which the effect has been produced, together with proper certificates of its practicability and adoption, to be delivered to the Society on or before the second Tuesday in March, 1824.

Preventing Explosions in Steam-engine and other closed Boilers.

257. To the person who shall invent and discover to the Society a method of rendering closed boilers used for Steam-engines and other purposes, safer than any now in use, and less liable to accidents from explosion;—*the Gold Medal, and not less than Thirty Guineas.*

Ample certificates that the method has been found to answer its intended purpose, to be produced to the Society on or before the last Tuesday in February, 1824.

An Original Screw.

258. To the person who shall invent and make known to the Society any mode of producing an Original Screw more perfect than any hitherto known; —*the Gold Medal,* or *Thirty Guineas.*

A model or complete drawing and description of the method, with a screw not less than twelve inches in length, to be produced to the Society on or before the last Tuesday in February, 1824.

Working Drawings of a Steam-engine.

259. To the person who shall produce to the Society the best Working Drawings in plan, elevation, and section, of a con-

proved state, with a full detail of its several parts, and an accurate description thereof;—*the Gold Vulcan Medal*, or *Thirty Guineas.*

The drawings and description to be produced to the Society on or before the first Tuesday in April, 1824, and if rewarded, to remain the property of the Society.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE, AND THE BRITISH COLONIES.

Taking Porpoises.

260. To the people in any boat or vessel, who, in the year 1823, shall take the greatest number of Porpoises, not fewer than thirty, on the coast of Great Britain or Ireland, for the purpose of extracting oil from them;—*the Gold Medal*, or *Thirty Guineas.*

Certificates of the number, signed by the persons to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in February, 1824.

Oil from Porpoises, or Sun Fish.

261. To the person who shall manufacture the greatest quantity of Oil from Porpoises or Sun-fish taken on the coast of Great Britain or Ireland, in the year 1823, not less than twenty tons;—*the Gold Medal*, or *Thirty Guineas.*

Certificates of the oil having been made from Porpoises or sun-fish actually caught on the coast of Great Britain or Ireland, and two gallons of the oil as a sample, to be produced to the Society on or before the last Tuesday in February, 1824.

Exporting British-cured Herrings.

262. To the person who, not having previously obtained this premium, shall import into the Hamburgh or other continental market previous to February, 1824, the greatest quantity of white herrings cured in British or Irish vessels, not less than 500 barrels, in quality at least equal to the best Dutch herrings, and which in the Hamburgh or other continental market shall produce prices at least equal to the best Dutch;—*the Gold Medal*, or *Fifty Guineas.*

263. For the next greatest quantity, not less than 300 barrels;—*the Gold Isis Medal*, or *Thirty Guineas.*

Proper certificates, and a sixteen gallon cask of the herrings, to be produced to the Society on or before the last Tuesday in February, 1824.

The same premiums to be continued one year longer on similar conditions.

In the 37th, 38th, and 40th volumes of the "Transactions," will be found valuable communications from Mr Denovan of Aberdour, on the cure of British herrings, to which the Society particularly wish to direct the attention of such persons as intend to claim this premium.

Curing Mackarel.

264. To the person who shall, in the year 1823, cure the greatest quantity of Mackarel, not less in number than ten thousand, in the best manner and to the satisfaction of the Society, the same being caught in the British or Irish seas, and cured in a British or Irish vessel or port;—*the Gold Isis Medal*, or *Twenty-five Guineas.*

265. For the next greatest quantity, not less than five thousand;—*the Silver Medal*, or *Fifteen Guineas.*

A sixteen gallon barrel of the mackarel to be produced to the Society on or before the first Tuesday in January, 1824, with certificates that the conditions of the premium have been fulfilled, and that the whole were cured in the same manner as the specimens, together with a full description of the process employed.

The same premiums to be extended one year farther, on similar conditions.

N. B. Specimens of cured mackarel, which promise to afford a most valuable article of trade and food, even superior to herrings, have been sent to the Society, and have induced them to turn the attention of the public thereto, by offering the above premiums.

Nutmegs, Mace, Cinnamon and Cloves.

266. To the person who shall grow the greatest quantity of merchantable Nutmegs, Mace, Cinnamon or Cloves, not less than twenty pounds weight, in any part of his majesty's dominions in the West Indies, or in any British plantation on the coast of Africa, or of the several islands adjacent thereto, and equal to those imported from the islands of the East Indies;—*the Gold Medal*, or *Fifty Guineas*.

Satisfactory certificates, from the governor or commander-in-chief, of the place of growth, with an account of the number of trees, their age, nearly the quantity of fruit on each tree, and the manner of culture, together with samples, to be produced on or before the first Tuesday in January, 1825.

The same premium is offered for the year 1826.

Kali for Barilla.

267. To the person who shall have cultivated, in the Bahama islands, or any other part of his majesty's dominions in the West Indies, or in any other British Plantation, in the year 1823, the greatest quantity of land, not less than two acres, with a Kali equal to the Spanish Kali for the purpose of making Barilla; — *the Gold Medal*, or *Thirty Guineas*.

268. For the next greatest quantity, not less than one acre; — *the Silver Medal*, or *Fifteen Guineas*.

Certificates signed by the governor or commander-in-chief for the time being, of the quantity of land so cultivated, and of the state of the plants at the time of signing such certificates, to be delivered to the Society, with samples of the kali, on or before the second Tuesday in February, 1824.

The same premiums, on similar conditions, will be given for Barilla grown in 1824.

Destroying the Insect commonly called the Borer.

269. To the person who shall communicate to the Society an effectual method of destroying the insect commonly called the Borer, which is so destructive to the sugar canes in the West India islands;—*the Gold Medal*, or *Fifty Guineas*.

The discovery to be ascertained by satisfactory certificates, under the hand and seal of the governor or commander-in-chief for the time being, and of some other respectable persons, inhabitants of the islands, or other place, in which the remedy has been successfully applied: such certificates to be delivered to the Society on or before the first Tuesday in February, 1824.

Cultivation of Hemp in Upper and Lower Canada, Nova Scotia and New Brunswick.

270. To the person who shall sow with Hemp the greatest quantity of land in the above mentioned provinces, not less than six arpents (each four-fifths of a statute acre), in the year 1823, and shall at the proper season cause to be plucked the summer hemp (or male hemp bearing no seed), and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe;—*the Gold Medal*, or *Two Hundred Dollars*.

271. To the person who shall sow with Hemp the next greatest quantity of land in the same provinces, not less than five arpents, in the year 1823, in the manner above-mentioned;—*the Silver Medal, or* 100 *Dollars*.

Certificates of the number of arpents, the method of culture, of the plucking of the hemp, with a general account whether sown broad-cast or in drills, and of the expense, soil, cultivation and produce, to be transmitted to the Society, certified under the hand and seal of the governor or lieutenant-governor, together with 28lbs. of the hemp, and two quarts of the seed, on or before the last Tuesday in April, 1824.

Importation of Hemp from Canada, Nova Scotia, and New Brunswick.

272. To the person who shall import to this country the greatest quantity of Marketable Hemp, not less than one hundred tons, in the year 1823, the produce of Canada, or of one of the above-mentioned provinces;—*the Gold Medal*.

273. To the person who shall import the next greatest quantity, not less than fifty tons;—*the Silver Medal*.

Certificates, satisfactory to the Society, to be produced by the master of the vessel on or before the last Tuesday in April, 1824, to testify that such hemp was grown and prepared in Canada, Nova Scotia, or New Brunswick.

Substitute for Hemp.

274. To the person who, in the years 1823, or 1824, shall raise at the Cape of Good Hope, in New South Wales, or in any of the British colonies, and import, a substitute for Hemp, not less than two tons, equally cheap, durable, and applicable to all the purposes for which hemp is now used;—*the Gold Medal*, or *Fifty Guineas.*

A quantity of the substitute, not less than 20lbs., together with the proper certificates from the governor, commander-in-chief, or secretary of the colony in which the same has been raised, to be produced to the Society on or before the last Tuesday in February, 1824.

The Society particularly direct the attention of the Public to the *Phormium tenax* or New Zealand Flax.

N. B. The premiums from No. 269 to 274, are all extended one year farther, on similar conditions.

Silk.

275. To the person who in the years 1823, 4 or 5, shall raise in any British Colony and import, the greatest quantity of silk proper for manufactures, not less than one hundred pounds weight, from silk worms bred there;—*the Gold Medal*, or *Fifty Guineas.*

Specimens of the Silk, not less than one pound, with an account of the method in which the Silk-worms were managed; the kind of the mulberry-trees from whence they were furnished with food, and particulars respecting the culture of the mulberry trees for that purpose, to be produced to the Society on or before the first Tuesday in March, 1824, 5, & 6.

276. For the next greatest quantity, not less than fifty pounds, on similar conditions;—*the Silver Medal*, or *Twenty Guineas.*

Satisfactory certificates from the governor commander-in-chief or Secretary of the Colony where the said Silk was produced, and of the several particulars above-mentioned, to be delivered to the Society along with the samples required.

The same premiums are specially offered for the Colonies of

277—278.—The Cape of Good Hope.

279—280.—The Mauritius.

281—282.—New South Wales.

Cocoa-Nut Oil.

283. To the person who shall, in the year 1824, import the largest quantity of Cocoa-nut oil, not less than fifty tons, and of the best quality;—*the Gold Medal*, or *Thirty Guineas.*

Proper certificates, with the bills of lading, and samples of the oil, to be produced to the Society on or before the last Tuesday in February, 1825.

This premium is proposed, particularly with a view to encourage the use of Cocoa-nut oil in the making of gas for the purpose of illumination, such gas having been found much superior to the gases commonly in use.

Olive Oil.

284. To the person who shall, in the years 1825, 6 and 7, manufacture and import the finest specimen of oil, not less than ten gallons, the produce of Olives grown in any British colony, in Africa or New South Wales;—*the Gold Medal.*

285. For the next greatest quantity, not less than six gallons;—*the Silver Medal.*

Specimens of the oil, not less than two quarts, together with satisfactory certificates, to be produced to the Society on or before the last Tuesday in February, 1826, 7 or 8.

Wine from the Cape of Good Hope.

286. To the person who shall import, in the years 1824 or 1825, the finest Wine, not less than twenty gallons, made from the produce of Vineyards at the Cape of Good Hope, or the parts adjacent;—*the Gold Medal.*

The above premium is not offered for the sweet or Constantia wine, the quality and value of which are sufficiently known, but to encourage the improvement of the vineyards more recently established.

Samples of the wine in bottles, bills of lading, and certificates of the governor or secretary of the colony, that the wine was made in the colony, to be produced to the Society on or before the first of March, 1824 or 1825.

Wine from New South Wales.

287. To the person who shall import in the years 1825 or 1826, the finest Wine, not less than twenty gallons, of good marketable quality, made from the

produce of Vineyards in New South Wales;—*the Gold Medal.*

Samples of the wine in bottles, bills of lading, and certificates of the governor or secretary of the colony, that the wine was made in the colony, to be produced to the Society on or before the first of March 1825 or 1826.

Wool from New South Wales.

288. To the person who, previous to February 1824, shall import into Great Britain or Ireland, the greatest quantity, not less than two tons, of fine wool, the produce of New South Wales;—*the Gold Medal.*

Proper certificates, with the bills of lading, and samples of the wool, to be produced to the Society on or before the last Tuesday in February, 1824.

289. For the next greatest quantity, not less than one ton, on similar conditions;—*the Silver Medal.*

Fine Wool from New South Wales.

290. To the person who shall produce to the Society the finest sample of wool, the produce of New South Wales, equal to the best Saxon;—*the Gold Medal.*

Not less than 14lbs. of the wool to be produced to the Society on or before the last Tuesday in February, 1824, together with certificates, that at least 5 cwt. equal to the sample has been imported by the claimant.

Cachemire Wool.

291. To the person who shall import the greatest quantity of real Cachemire wool, not less than 1cwt. freed from the hair, and in a state fit for spinning;—*the Gold Medal.*

Samples of the Wool, not less than 5lbs. weight, with bills of lading and other necessary documents, to be produced to the Society on or before the last Tuesday in March, 1824.

This premium is continued two years longer on similar conditions.

Importing the Cachemire Shawl Goat.

292. To the person who shall have imported into the United Kingdom, subsequent to the first of January, 1824, the greatest number, not fewer than three females and two males, of the real Cachemire Shawl Goat;—*the Gold Medal.*

Certificates that the goats are of the real Cachemire breed, and that they are in health at the time of making the communication, to be produced to the Society on or before the first Tuesday in March, 1824.

This premium is offered also for the years 1825 and 1826.

China Paper for Copper-Plate Printing.

293. To the person who shall communicate to the Society the best account of the process employed in China for the manufacture of paper used in England for Copper-Plate Printing, and known by the name of India Paper, together with an account of the materials from which such paper is made;—*the Gold Medal*, or *Fifty Guineas.*

Specimens of the paper, not less than one ream, with samples of the materials in their raw or unmanufactured state, and satisfactory certificates, to be produced to the Society on or before the first Tuesday in March, 1824, or 1825.

Annatto.

294. To the person who, in the year 1823, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of Annatto, equal to that imported from Spanish America, not less than one hundred weight;—*the Gold Medal.*

A quantity of the annatto, not less than ten pounds weight, to be produced to the Society, with proper certificates, signed by the governor or secretary of the respective settlement, that the annatto is the produce of such settlement, on or before the last Tuesday in February, 1824.

True Cochineal.

295. To the person, who in the year 1823, shall import into the port of London, from any part of the British settlements in the East or West Indies or any other British plantation, the greatest, quantity of true Cochineal, equal to that imported from Spanish America, not less than one hundred weight;—*the Gold Medal.*

A quantity of the Cochineal, not less

than three pounds weight, with proper certificates, signed by the governor or secretary of the respective settlement, that the Cochineal is the produce of such settlement, to be produced to the Society on or before the first Tuesday in February, 1824.

N. B. The premiums from No. 292 to 295 inclusive, are all extended two years farther on similar conditions.

Short-Reeled Brutia Silk.

296. To the person who previous to the 1st of March, 1824, shall have imported into Great Britain the greatest quantity of Brutia or Levant silk, not less than five bales (heretofore long-reeled), of a reel not more than 75 inches in circumference, so as to be wound by the engines in ordinary use;—*the Gold Isis Medal* or *Thirty Guineas.*

Proper certificates with bills of lading, and samples of the silk to be produced to the Society on or before the first Tuesday in April, 1824.

Cultivation of Tea.

297. To the person who shall grow and prepare the greatest quantity of Tea, of good quality, not being less than 20lbs weight, in the the Island of Jamaica or in any other British West Indian Colony, and shall import the same into Great Britain; — *the Gold Medal*, or *Fifty Guineas.*

Satisfactory certificates from the governor or secretary of the colony, that such Tea was grown and prepared in the colony; together with an account of the number of Tea-trees, their age, mode of culture, of gathering, drying and preparing the leaves, and samples of the tea; to be produced to the Society on or before the first Tuesday in February 1827.

The same premium is offered for the colonies of

298. The Cape of Good Hope.

299. The Mauritius.

300. New South Wales.

China Tea.

301. To the person who shall communicate to the Society, from information obtained in China, the best and most authentic account of the culture of the plant or plants, the leaves of which furnish the different kinds of tea; together with the method of gathering, drying, and otherwise preparing the leaves;—*the Gold Medal.*

The communication, with the necessary certificates, to be sent in to the Society on or before the last Tuesday in March, 1824.

This premium is extended to the years, 1825 and 1826.

Dried Fruits.

302. To the person who shall prepare and import into Great Britain the greatest quantity, not less than 100lbs of dried fruits, similar to those now imported from the Mediterranean, of good quality and the growth of the colony of New South Wales;—*the Gold Ceres Medal.*

Satisfactory certificates from the governor or secretary of the colony, that the fruits were grown and prepared in the colony, with samples of the fruits, to be presented to the Society on or before the first Tuesday in February, 1825.

This Premium is also extended to 1826.

The same premium on similar conditions is offered for the colonies of

303. The Cape of Good Hope.

304. The Mauritius.

Extract of Mimosa Bark.

305. To the person who in the year 1824, shall import into Great Britain the greatest quantity (not less than one ton), of extract of Mimosa Bark, prepared in the Colony of New South Wales, at a price not greater than that of the extract of foreign Oak-bark, and equally applicable as that to the purpose of Tanning; —*the Gold Isis Medal*, or *Thirty Guineas.*

Satisfactory certificates from the governor or secretary of the colony, that the extract was prepared from the bark of trees growing in the colony, together with a full account of the process of preparing it, and samples of the extract, to be produced to the Society on or before the last Tuesday in January, 1825.

This premium is extended to the year 1826.

Diminution of Human Labour in the Cultivation of Sugar, &c.

306. To the person who previous to the first of January, 1825, shall present to the Society a satisfactory account, founded on experience, of the most advantageous mode of diminishing the labour of persons employed in the Cul-

tivation of Sugar, Cotton, and Coffee in the West Indian Colonies, by the substitution of agricultural machinery or by the use of Cattle ;—*the Gold Medal*, or *Fifty Guineas.*

Extirpating the Stumps and Roots of Trees.

307. To the person who shall invent and discover to the Society, the best method, verified by actual experience of raising out of the earth and removing the stumps and roots of trees which have been left after felling the timber, so as to clear the land for the purposes of cultivation ;—*the Gold Medal*, or *Fifty Guineas.*

Certificates that the method has succeeded with at least fifty trees of large girth and a full description of the means employed, to be delivered to the Society on or before the last Tuesday in February, 1824.

BRITISH MARBLES.

THE SOCIETY considering that it would be beneficial to the Commerce of the United Kingdom to bring the British Marbles into general use, and that the most effectual method of accomplishing their object would be, for the present, *to make them more generally known in the Capital, have come to the following Resolution:—*

That specimens of British Marbles be exposed in the Society's Rooms, in the Adelphi, for the inspection of the public under the following regulations:

1st, That all the specimens be exact to a given size, viz. eight inches high, six inches broad, one thick, and polished on one face.

2nd, That a book be kept, containing the number of each specimen, and describing the situation of the quarry, the name and situation of the parish, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the Marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future inquiries.

As the exertions of the Society can be generally beneficial only inasmuch as their views are seconded by the public, the Society request, that all proprietors of Marble Quarries will favour them with a specimen of the Marble, worked to the exact size above-mentioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public. By such arrangements, it is expected, that the interest of the proprietors of the quarries will be promoted, and the use of British Marble much extended. A variety are already exhibited in the Society's Room's.

REWARDS BESTOWED BY THE SOCIETY DURING THEIR SESSION WHICH COMMENCED ON THE FIRST WEDNESDAY IN NOVEMBER, 1822, AND CLOSED ON THE SECOND WEDNESDAY IN JUNE, 1823.

IN AGRICULTURE AND RURAL ECONOMY.

1. To Lieutenant-colonel Wildman, Newstead Abbey, for planting 500 acres with Forest Trees, *the Gold Ceres Medal.*
2. To Messrs. Cowley and Staines, Winslow, Bucks, for preparing 143lbs. of Opium from Poppies grown in England, *Thirty Guineas.*
3. To J. W. Jeston, Esq. Henley on Thames, for his improved mode of collecting the juice of the Opium Poppy, *the large Silver Medal.*
4. To W. Pyle Taunton, Esq. Cheam, Surry, for early Horse-beans, *the large Silver Medal.*

IN CHEMISTRY.

1. To Mr. James Marsh, Rush Grove Place, Woolwich, for a portable electro-magnetic apparatus, *the large Silver Medal* and *Thirty Guineas.*
2. To Mr. H. Marshall, Newcastle-on-Tyne, for improved melting-pots for brass-founders and steel makers, *the large Silver Medal.*

3. To Mr. J. T. Cooper, 9, Paradise Street, Lambeth, for his improvements in the apparatus for analysing vegetable and animal substances, *the large Silver Medal.*
4. To the same, for a hydrometer for saline solutions, *the Gold Vulcan Medal.*
5. To G. Gurney, Esq. 7, Argyll Street, for an oxy-hydrogen blowpipe, *the Gold Vulcan Medal.*

IN POLITE ARTS.

1.—ORIGINAL OIL PAINTINGS.

1. To Mr. G. Hilditch, Jun. 13, Ludgate Hill, for a landscape, *the Gold Isis Medal.*
2. To Mr. R. H. Hilditch, 13, Ludgate Hill, for a landscape, *the large Silver Medal.*
3. To Miss Eliza Anne Drummond, 5, Rathbone Place, for an historical composition, *the Silver Isis Medal.*
4. To Mr. Philip Simpson, 10, Carlisle Street, Soho, for a portrait, *the Gold Isis Medal.*
5. To Mr. J. G. Middleton, 24, Manor Place, Walworth, for a portrait, *the large Silver Medal.*
6. To Mr. Jos. Miles Gilbert, Bristol, for a marine painting, *the Silver Isis Medal.*
7. To Mr. H. Pearsall, Bath, for a landscape, *the Silver Isis Medal.*
8. To Mr. F. W. Watts, Hampstead, for a landscape, *the large Silver Medal.*
9. To Mr. J. Porter, 25, Welbeck Street, for an historical composition, *the Silver Isis Medal.*
10. To Miss Rose Emma Drummond, 5, Rathbone Place, for an historical composition, *the large Silver Medal.*

2.—COPIES IN OIL.

11. To Miss Jane Drummond, 5, Rathbone Place, for a portrait, *the Silver Isis Medal.*
12. To Mr. H. Johnson, 7, Rodney Buildings, Kent Road, for a portrait, *the large Silver Medal.*
13. To Mr. F. Rochard, 131, New Bond Street, for an historical subject, *the Silver Isis Medal.*
14. To Mr. S. Drummond, 14, Church Street, Soho, for an historical subject, *the large Silver Medal.*

3.—ORIGINAL PAINTINGS IN WATER COLOURS.

15. To Miss Robson, Doncaster, for a composition of flowers, *the Silver Isis Medal.*
16. To Miss Mary Willis, 49, Upper Norton Street, for a composition of flowers, *the large Silver Medal.*
17. To Mr. T. Richmond, 42, Halfmoon Street, for a portrait, *the Silver Isis Medal.*
18. To Miss M. Ross, 52, Upper Charlotte Street, Fitzroy Square, for a portrait, *the large Silver Medal.*
19. To Miss Frances Eddy, Plymouth, for a composition in flowers, *the Silver Isis Medal.*

4.—COPIES IN WATER COLOURS.

20. To Mr. James Hamilton Lawson, 30, Berners Street, for a portrait, *the Silver Palette.*
21. To Mr. T. Baynton, Bath, for a landscape, *the Silver Isis Medal.*
22. To Miss Matilda Smith, 18, Upper King Street, Bloomsbury, for a portrait, *the large Silver Medal.*
23. To Miss Mary Jane Hull, Beverly, for a portrait, *the Silver Isis Medal.*
24. To Miss Mary Willis, 49, Upper Norton Street, for a flower-piece, *the Silver Isis Medal.*
25. To Mr. Frederick Rochard, 131, New Bond Street, for a portrait, *the Silver Isis Medal.*
26. To Mr. G. R. Ward, 6, Newman Street, for a portrait, *the large Silver Medal.*

5.—ORIGINAL DRAWINGS IN CHALK.

27. To Mr. J. A. Cahusac, Mount Street, Whitechapel, for a drawing of the Musk Ox, *the Silver Palette.*

6.—COPIES IN INK, CHALK, PENCIL, &c.

28. To Mr. C. Horatio Bunning, 11, Bernard Street, Russell Square, for an historical subject, *the Silver Palette.*

29. To Mr. T. Barrett, 78, Mark-lane, for an historical subject, *the Silver Palette.*
30. To Miss Ann Hopkins, 83, Berwick Street, for a landscape, *the Silver Palette.*
31. To Miss Rowe, Tor-Point House, Cornwall, for an historical subject, *the Silver Isis Medal.*
32. To Miss Eliz. Clark, 6, Cadogan Terrace, for an historical subject, *the large Silver Medal.*
33. To Mr. W. Baker, 59, Stafford Place, Pimlico, for an historical subject, *the Silver Isis Medal.*
34. To Mr. Ebenezer Stalker, Jun. 5, Southampton Crescent, Euston-square, for a landscape, *the Silver Isis Medal.*
35. To Miss Louisa Mary Vully, 59, Stafford Place, Pimlico, for a head, *the Silver Isis Medal.*

7.—DRAWINGS IN OUTLINE, FROM STATUES.

36. To Mr. I. Solomon, 86, Piccadilly, for the Laocoon, *the large Silver Medal.*

8.—FINISHED DRAWINGS FROM STATUES AND BUSTS.

37. To Miss Sarah Cox, 22, Nottingham Street, for a drawing from a bust, *the Silver Isis Medal.*
38. To Miss Jane Stalker, 5, Southampton Crescent, Euston-square, for a drawing from a bust, *the Silver Palette.*
39. To Mr. Evan Williams, 6, Charlotte Street, Bloomsbury, for a drawing from a bust, *the Silver Isis Medal.*
40. To Mr. Phil. Corbet, 482, Strand, for a drawing from a statue, *the large Silver Medal.*
41. To Mr. P. H. Desvignes, 16, Hunter Street, Brunswick-square, for a drawing from a bust, *the Silver Palette.*
42. Mr. J. Padgett, 96, Sloane Street, for a drawing from a bust, *the large Silver Medal.*
43. To Mr. Ebenezer Stalker, 5, Southampton Crescent, Euston-square, for a drawing from a bust, *the Silver Palette.*
44. To Mr. T. Fairland, 4, Princes Street, Commercial Road, Lambeth, for a drawing from a figure, *the Large Silver Medal.*
45. To Mr. E. Williams, Ambroseden, Bicester, for a drawing from an entire figure, *the Silver Isis Medal.*
46. To Mr. S. W. Cecil, 59, Stafford Place, Pimlico, for a drawing of an anatomical figure, *the large Silver Medal.*

9.—ORIGINAL MODELS IN PLASTER.

47. To Mr. Ed. Edwards, 2, Newcastle Street, Clerkenwell, for a groupe, Ulysses and Calypso, *the Gold Isis Medal.*
48. To Mr. Ed. G. Physick, 20, Spring Street, Portman-square, for two single figures —Telemachus and Narcissus, *the large Silver Medal.*

10.—MODELS IN PLASTER, COPIES.

49. To Mr. Mich. Teasdale, 1, Bond Street, Vauxhall, for a head, *the Silver Palette.*
50. To Mr. Jos. Deare, 12, Great St. Helen's, for a model of a Bacchus, *the Silver Isis Medal.*
51. To Mr. Ed. Edwards, 2, Newcastle Street, Clerkenwell, for a model in the round from a group, *the large Silver Medal.*

11.—ARCHITECTURE.

52. To Mr. P. H. Desvignes, 16, Hunter Street, Brunswick square, for a drawing of a Corinthian capital, *the Silver Isis Medal.*
53. To Mr. C. Purser, 10, Laurence Pountney Lane, for an original design for a British Museum, *the Gold Medallion.*
54. To Mr. Henry Bassett, 15, Norfolk Street, Strand, for an original design for a British Museum, *the Gold Isis Medal.*

12.—CARVING IN WOOD.

55. To Mr. Nicholl, 6, Grafton Street, East, for a carving in wood of a figure, *the Gold Isis Medal.*
56. To Mr. Henry Bailes, 434, Oxford Street, for an original carving of flowers, *the Silver Isis Medal.*
57. To Mr. James Harris, Plymouth, for a syringe to preserve oil paint in, *the large Silver Medal* and *Ten Guineas,*

58. To C. Warren, Esq. for his improvements in the art of engraving on steel-plate, *the large Gold Medal.*
59. To W. Brockedon, Esq. 11, Caroline Street, Bedford Square, for a rest for painters, *the Silver Isis Medal.*
60. To Mr. W. Deeble, 1, Seymour Place, Islington, for his method of taking casts of leaves and foliage, *the Silver Isis Medal.*
61. To Mr. G. Mills, 17, Ossulston Street, Somers Town, for the new die of the Vulcan Medal presented by him, *the Gold Vulcan Medal.*

IN MANUFACTURES.

1. To Mr. W. V. Shenton, Winchester, for an improved engine for tramming silk, *the Silver Vulcan Medal.*
2. To Mr. W. Cobbett, Kensington, for plat from English Grass, *the large Silver Medal.*

IN MECHANICS.

1. To Mr. C. A. Siebe, for a tap for hollow screws, *the Silver Vulcan Medal,* and *Five Guineas.*
2. To Mr. E. Pechey, Bury St. Edmund's, for a mangle, *the Silver Vulcan Medal* and *Ten Guineas.*
3. To Ed. Speer, Esq. 7, New Inn, for his centrifugal check hooks, *the Silver Vulcan Medal.*
4. To R. W. Wilkinson, Esq. Captain R. M. Chatham, for a marine arm-chest, *the large Silver Medal.*
5. To J. Amesbury, Esq. 82, Great Surrey Street, for an apparatus for fractures of the lower limbs, *the Gold Vulcan Medal.*
6. To Mr. W. Raynes, 10, Regent Street, Westminster, for a cap for fractured patella, *the Silver Vulcan Medal,* and *Ten Guineas.*
7. To Mr. James Jones, 150, High Holborn, for a kiln for drying grain, *the large Gold Medal.*
8. To Mr. Jas. Dennet, 7, Regent Street, Mile End, for an apparatus for baling Ships, *the large Silver Medal.*
9. To C. C. Dansey, Esq. Captain Royal Artillery. Havering, for a kite for effecting a communication between a stranded ship and the shore, *the Gold Vulcan Medal.*
10. To Mr. J. Evans, 12, Ellen Terrace, St. George's in the East, for his method of equalizing the strain on tackles, *the large Silver Medal.*
11. To Mr. J. Elliott, Sheffield, for his apparatus for the use of dry grinders, *the Gold Vulcan Medal.*

IN COLONIES AND TRADE.

1. To Mr. J. F. Denovan, Aberdour, Fifeshire, for exporting British cured herrings *Fifty Guineas.*
2. To Mr. Gregory Blaxland, for wine, the produce of his vineyard in New South Wales, *the large Silver Medal.*

The Society have also directed, that the following performances in the class of Polite Arts, be exhibited on account of their merit, with those to which premiums have been awarded.

A finished anatomical drawing, by Mr. G. Simpson.
An original Painting of flowers, by Miss Bowley.
A copy of a miniature, by Mr. Edwin Dalton.
A finished drawing of the Gladiator, by Mr. J. Padgett.
A drawing of the Altar Screen of St. Saviour's Church, Southwark, by Mr. G. Gwilt, Jun.
A copy, in oil, from the bust of Homer, by Mr. Philip Corbett.
A copy of a miniature, by Miss Mary Anne Hale.

The Society have also voted their special Thanks

To Captain Hawkins, for his plantations of Forest Trees, near Kingsbridge, Devon.
To Mr. T. Jones Ludgate Hill, for his guard to the wheels of waggons.

☞ Since the last DISTRIBUTION, One Hundred and Twenty-five new Members have been elected.

By Order, ARTHUR AIKIN, *Sec.*

PAPERS
IN
AGRICULTURE.

Nº I.

PLANTING FOREST TREES.

The GOLD CERES MEDAL *was this Session given to Lieut.-Col.* WILDMAN, *of Newstead Abbey, in the County of Nottingham, for planting* 500 *Acres of Sandy Land, incapable of profitable Culture, with* FOREST TREES. *The following Communication has been received from the Candidate.*

Sutton Bonnington,
Feb. 16, 1822.

SIR;

THE estate and manor of Newstead, in the county of Nottingham, late the property of lord Byron, was purchased by colonel Wildman, at Lady-day, 1818, and possession was taken of it at that time. A part of this estate, near a thousand acres, is very poor dry sand land, unfit for tillage, and not worth the expense of cultivating; there not being depth of soil, it only produced heath. Being of no use whatever in its present state, it was advisable to plant this unproductive part, and on recommending it to the owner, he most readily consented to have it planted with forest trees, being assured that they would overtake some other plantations in the same county. On examination of some plantations in the neighbourhood, which had been planted about 4 or 5 years, I found they had grown very ill, and the plants were very little higher than when first planted, and a great number of them were dead. I was informed it was the case with all the plantations on such land in the neighbourhood, that they made very little progress for the first 4 or 5 years, but that those which then remained alive took to growing better every year after as they went on. Finding many of these plants dead in the different plantations examined by me, and wishing to ascertain the cause, I took some of the dead plants up; these I found had been planted in very shallow holes, and when put in (being planted by the acre by bargain) a nick only had been made in the planting holes, with the spade struck in and moved just forward and backward, thus forming a narrow nick, into which the plant was thrust. The nick not being sufficiently wide to admit the plants, their roots were squeezed close and flat together, and, by forcing and thrusting the plants in, their roots, in many instances, were bent back to the surface of the soil, which sufficiently accounted for their growing so little, and for so many of them dying. On preparing and opening the holes on the Newstead estate, in the Autumn of 1818, I found, on getting through the sand, at the depth of 6 or 7 inches from the surface, a cank, or sand stone, about three inches thick and very hard; I directed this cank to be cut through, and underneath was another bed of sand: supposing the not cutting through this hard stone was the cause of the plants not growing for the first 4 or 5 years, till they had strength to penetrate into and through the hard stone, I determined to have this cank cut through, in order that the roots might have room to expand and grow freely. Positive directions were given to the men to that effect in every hole they made, which was done in the Autumn, that the planting might be proceeded on in the Spring. The holes were made among the heath, about 5 feet apart. The Spring following, in 1819 (having procured good healthy plants, which had been transplanted out 2 years, about 18 inches high), I commenced the planting; the plants were first of all dressed by shortening the straggling roots, and taking off what was broken. The holes were opened, and the plants were placed in, sinking them about 2 or 3 inches of the stem below the level of the surface; some of the finest earth was put among the roots, shaking the plants with the hand, and drawing them gently up at the same time, so as, finally, to leave them *standing very little deeper* than they did in the nursery; the rest of the earth was then put in, and the plants were fixed firm and set straight with the foot, leaving the top of the holes a little dished, for the rain to drain to the roots. The planting was not let by job, or bargain, to a nursery planter; but about 30 men and upwards (most of them the stocking-makers that were out of employ) were employed the whole winter to make the pits, or holes, for the young trees, with a superintendent to work and be with them during the holeing, to see it done according to the directions given, and also to attend to planting the young trees according to order; great care and attention were also given to see that all was done in a proper manner. I have the satisfaction to say that, in consequence, not one plant in a hundred died; and that though the plantation has not been made four years, the trees are now, on an average, from five to nine feet high, very healthy, and in as thriving a state as can possibly be;

indeed, they are grown considerably higher than some plantations which have been made four or five years before them: this growth is attributable to cutting through the three-inch stone, and planting the young trees in the manner and with the care above-mentioned.

The cost of the plantation, holeing the ground, setting the trees, and every expense included, did not amount to four pounds ten shillings per acre.

The fences round these plantations are all made at colonel Wildman's expense, and are kept in good order and repair; nearly one-half is a dry stone wall against the park nearly 7 feet high, and the remainder is a substantial post and rail fence, with a ditch on the outside, and a thorn quick fence planted within.

In the Spring of 1819, as before stated, the planting commenced, and about 300 acres were planted that Spring, about 5 feet apart, which took 682,200 plants, being about 2,200 to the acre; they consisted of oak, elm, beech, larch, Scotch and spruce firs; about one-fourth part of which number (to the acre) viz. 250 oak, 150 elm, and 50 beech, amounting to 450 forest trees, were planted on each acre, and 1,750 larch, spruce, and Scotch fir were put in as nurses. Considering the larch to be the most useful and profitable to take down at a few years' growth, in order to thin and make room for the forest trees, more than two-thirds of the 1,750 were larch, and the remainder spruce and Scotch.

In the Spring of 1820 about 200 acres more were planted, 5 feet apart, and took about 450 thousand plants, consisting of oak, elm, beech, larch, Scotch and spruce firs, which were managed and set in the same manner, and in the same proportions as the above in 1819, making the total quantity of land planted 500 acres, and 1,132,200 trees planted.

In forwarding this to the Society as a candidate for the honour of its reward, the owner, whose views in this undertaking it has been my duty to carry into effect for its accomplishment, may be considered not undeserving the favourable notice of the Society.

I am, Sir,
&c. &c. &c.
JAS. ORMES, *Agent to Lieut.-Col. Wildman.*

To A. Aikin, Esq.
Secretary, &c. &c.

CERTIFICATES.

I, THE undersigned, do hereby certify the foregoing to be a faithful and correct statement.

JAS. ORMES, *Agent to Lieut.-Col. Wildman.*

I HEREBY certify that I am acquainted with Newstead, in the county of Nottingham, and have seen and inspected the plantations made there by colonel Wildman. I believe them to be about 655 acres planted, and about 1,462,200 young trees in the said number of acres. That the whole is well and effectually fenced all round, and that the young trees are in a very healthy and flourishing condition, and are growing faster than some in the neighbourhood which have been longer planted. That the whole of the said plantations were commenced in the Spring of 1819, at which time the land was waste and overgrown with heath and broom, and mostly an old rabbit warren.

JOHN SAVILE LUMLEY.

Newstead,
March 4, 1823.

We, the undersigned, do hereby certify, that we are well acquainted with Newstead, in the county of Nottingham, being resident in the adjoining parishes in the said county, and also well acquainted with the plantations made by colonel Wildman in Newstead; and that we believe there are 655 acres of land, planted in the lordship of Newstead; and that there are about 1,462,200 trees planted in the said 655 acres; and that the said plantation is well and effectually fenced all round; and that the young trees are in a very healthy and flourishing condition, and are growing fast and as well as any plantation we have in the neighbourhood.

W. Sherbrooke.
Henry Coape.
Thomas Hurt, *Rector of Lyndby.*
John Taylor, *Timber Dealer, Hucknall, Tookard.*
J. Brown, *Land Surveyor and Valuer, Nottingham.*

N° II.

PLANTING FOREST-TREES.

The Thanks of the Society were voted this Session to CAPTAIN HAWKINS, *of Quay House, near Kingsbridge, Devon, for the following Communication respecting a Plantation of* FOREST-TREES, *made by him on 24½ Acres of Land, incapable of cultivation.*

Quay House, near Kingsbridge, Devon,
October 1, 1822.

SIR;

I BEG leave to detail some of the experiments made since my return from India, four years ago, in improving thirty acres of waste land on an estate of mine, called Flear, three miles from the town of Kingsbridge, in Devonshire, the greater part of the land not being worth half a crown an acre, and some of it not even sixpence an acre.

About two acres of this land, covered with immense heaps of rubble, thrown out from old slate quarries, being well situated for a cider orchard, and four acres and half of rocky ground lying favourable for irrigation, I converted the last-mentioned portion, at a considerable expense, into a watered meadow, and the other portion I prepared and planted with apple-trees.

But although the meadow promises to yield a fair crop of hay during the next season, and the orchard has this year produced some bushels of apples, yet, as all that I mean to do to them will not be completed before the next Spring, I propose to defer the description of the method adopted in converting these two portions of useless ground to such valuable purposes; confining myself at present to the description of the remaining twenty-four acres and half, which were planted with forest-trees.

Of this quantity, seventeen acres and half was a brake of the common *dwarf* English furze, lying on the side of a steep rugged hill facing the West: being at first unwilling to plant the whole quantity, the furze was rooted out from six acres of the most even land, which was then ploughed, manured with lime, and sown to oats; but the crop failed, and I then determined to plant the whole, engaging Mr. John Pontey, nurseryman and planter, of Plymouth, for that purpose.

Mr. Pontey having viewed the land, advised me to proceed in rooting out the furze with mattocks, and to clear all the land previous to planting the young trees, similar to the six acres already cleared and sown to oats the season before, and accordingly four acres more were cleared of the furze roots. But finding the rooting up of the furze tedious and expensive, I determined to plant the young trees in the remaining seven acres and half, in pits dug among the furze roots, previously cutting off the growing furze close to the ground with a hook, and without any other preparation of the land whatever.

The land then was prepared for planting in three different ways, viz. one portion was cleared of the furze roots ploughed and sown to oats; a second portion was cleared by rooting out the furze with mattocks, without using the plough, which indeed could not have been worked; and the third portion underwent no other preparation but that of cutting off the growing furze with a hook.

Mr. Pontey undertook to plant fifteen acres and half by contract, between the first day of October, 1818, and the first day of April, 1819, at the rate of 2,750 young forest-trees per acre, of from one to two feet and a half high, and to fill up all vacancies during the two following years, excepting such trees as might be destroyed by the depredations of cattle, for three pounds per thousand trees. The other two acres of furze brake being very rugged and rocky, were planted during the same season by Richard Penny and other labourers, by the day. The remaining six acres, situate on the slopes of old slate quarries, and on the sides of brooks and other places not fit for cultivation, were planted in a similar manner during the following season, by Richard Penny and others, by the day, without any further preparation to the land than cutting off the growing furze with a hook. The young trees were planted four feet asunder, amounting in the whole to 53,253 trees, averaging about twenty inches high.

In the Spring following the planting of the young trees, the furze roots sprouted, and I caused the furze shoots interfering with the young trees, together with the grass, brambles, and weeds contiguous to them, to be cut off with a hook, and placed around the roots of the young trees, leaving the furze shoots, grass, &c. standing in the intervening spaces between the trees to shelter them from the wind and storms. The same process was followed in the other portion of the plantations previously sown to oats, and likewise in that portion from which the furze roots had been dug up with mattocks; repeating the process three different times during the first season, twice the second, and once the third year.

The parings of the furze, grass, &c. placed around the young trees, protected their roots from the sun, retained the moisture in the land, and formed an excellent manure. The expense of the process was trifling, a man being able to accomplish about three parts of an acre in one day. The young trees have now completely overcome the furze and all other undergrowth, requiring no further care.

The result of the whole has been less failures among the young trees than Mr. Pontey, an old planter of upwards of thirty years experience, has ever known; and although the same process of cutting the undergrowth was practised on every part of the plantations, and all of the young trees are exceedingly vigorous and luxuriant, still, contrary to all expectation, the young trees planted among the furze roots have a decided superiority over the portion previously sown to oats, and to that cleared of the furze roots with mattocks, there being scarcely any perceptible difference between the two last-mentioned portions.

As the method above described of planting young forest trees in brakes of furze seems to be in every respect preferable to the common mode, and far less expensive and, as the method of cutting the undergrowth, and placing it around the roots of the young trees has produced uncommon vigour and luxuriance, and ensured less failures among the young trees, thereby securing the highly desired object of bringing up all the trees of young plantations of the same age and growth, not only among the furze, but likewise on the land prepared for planting in the usual way, I have been induced to lay the above account before the Society, accompanied, I trust, by satisfactory certificates.

I am, Sir,

A. Aikin, Esq. &c. &c. &c.
Sec. &c. &c.

J. Hawkins.

CERTIFICATES.

Plymouth, May 18, 1822.

I, JOHN PONTEY, of Plymouth, do hereby certify, that I, with my servants under my direction, have planted on captain John Hawkins's estate, called Flear, in the parish of East Allington, near Kingsbridge, in the county of Devon, between the 1st day of October, 1818, and the 1st day of April, 1819, 4,235 young oaks, 3,260 elms, 2,400 ash, 1,185 beech, 700 sycamore, 330 sweet chesnut, 12 horse-chesnut, 160 walnut, 50 poplars, 40 limes, 20 planes, 17 birch, 30 pincasters, 70 silver firs, 40 balm of Gilead firs, 130 spruce firs, 5 black spruce firs, 10 Norway firs, 40 black American firs, 5 Weymouth pine firs, 30 of sorts firs, 28 deciduous seedlings of sorts, 12,850 larch, and 12,560 Scotch firs; total, 38,207 trees, of from 1 to 2½ feet high. The whole were planted to remain as a timber wood, but the Scotch firs were mostly planted so as to shelter the other trees exposed to the West and South West winds. The young trees were planted with the intention of averaging about 2,750 per acre, but the land in many places was so full of rocks, stones, and other impediments, that it was impossible so to plant them with accuracy. The land planted by me is fifteen acres and half; it had all been originally a brake of the common dwarf English furze, five acres and half of which had been thoroughly cleared and ploughed a few years ago, and sown with oats, after a lime manure, but the crop failed; four acres were cleared of the furze immediately previous to planting the young trees, by digging the furze up with mattocks, and thoroughly cleansing the land: and the remaining six acres were planted by digging holes for the young trees among the furze roots, the growing furze being previously cut off close to the ground with a hook, without any other preparation of the land whatever.

My agreement with captain Hawkins was, to fill up all failures among the young trees during the two succeeding years after they were planted. I viewed the whole plantation this present Spring, and I do further certify, that I never experienced fewer failures, nor ever saw a more thriving plantation of young forest trees, particularly in that part where the furze had been cut off with a hook, in the course of my life, although I have been a planter upwards of thirty years; much of the success I attribute to captain Hawkins's care and management of the young trees after they had been planted by me.

Witness my hand this 18th day of May, 1822.

JOHN PONTEY.

Dodbrooke, May 20, 1822.

I, RICHARD PENNY, of Dodbrooke, near Kingsbridge, Devon, labourer in husbandry, do hereby certify, that I, with other labourers under me, did plant on captain John Hawkins's estate, called Flear, in the parish of East Allington, near Kingsbridge, between the 1st day of October, 1818, and the 1st day of April, 1819, 604 young oak trees, 525 young elms, 805 young ash, 75 young beech, 50 sycamores, 12 chesnuts, 5 walnuts, 20 poplars, 5 planes, 5 birches, 25 pinasters, 20 silver firs, 20 balm of Gilead firs, 25 spruce firs, 10 black spruce firs, 10 black American firs, 149 larches, and 387 Scotch firs, in all 2,752 trees.

The whole extent of land planted as above by me, is upwards of two acres; all of the young trees were planted in similar soil, among rocks, and in hilly and broken ground, with mattocks and shovels, where it was impossible for a plough to be worked. The land had been originally a brake of the common dwarf English furze, which was rooted out with mattocks from one moiety of the land, and thoroughly cleared previous to planting the young trees; the other moiety of the land was not cleared, the growing furze being merely cut off with a hook, and the young trees planted in holes dug among the furze roots.

I do likewise certify, that I did plant on the same estate, in the following season, 1819 and 1820, without any preparation to the land further than cutting the furze with a hook, 12,294 young trees of the above sorts, in about six acres and half of land, situate by the sides of brooks, on the slopes of old slate quarry rubbish, and among rocks and uneven ground not fit for cultivation.

I further certify, that I planted 12,000 white-thorn plants to fence the plantations made by me, and those made by Mr. John Pontey, nurseryman of Plymouth, in 1818 and 1819. And that in the following season I planted 5,000 young thorn plants to fence the plantations made by me during that season.

And I do hereby certify, that all the young trees are at this time healthy and vigorous, but those trees planted on the land from which the furze had been merely cut off with a hook, thrive better than those trees planted after the land had been cleared of the furze by rooting it out at a considerable expense, and I believe this portion of the plantations to be superior to any in this neighbourhood.

As witness my hand, made this tenth day of May, 1822.

The mark of Richard Penny ✕.
Witness, A. Richards.

We, whose names are underwritten, do hereby certify, that we have viewed the new plantations on captain John Hawkins's farm, called Flear, situate within the parish of East Allington, in the county of Devon, and we have the satisfaction to say, that the sundry plantations on the farm are in the most thriving state (perhaps equal to any in the West of England, of the same dimensions) containing about twenty-four acres, seventeen and a half of which have been certified (and we believe correctly) to have been planted between the first day of October, 1818, and the first day of April, 1819.

One remarkable fact which came within our observation, and which, we think, ought to be particularly noticed, is, that those trees that were planted in brakes of furze having holes simply dug up with a mattock, and the growing furze cut off with a hook, were in a more thriving state than those which had been planted at the same time in similar soil, after the whole of the furze had been rooted and cleared off the land, at a considerable expense.

The fences surrounding these plantations are remarkably well made and strong, and planted mostly with white-thorns.

Witness our hands, this 27th day of May, 1822.

Thomas Harris, *Solicitor.*
Robert Foule, *Yeoman.*
Thomas Shepherd, *Do.*
Nicholas Elliot, *Do.*
Joseph Hyett, *Do.*
Joseph Hyett, Jun. *Do.*
Ephraim Hyett, *Do.*
Richard Hyett, *Do.*
John Eddy, *Do.*
Henry Eddy, *Do.*
George Crimp, *Carpenter.*
Thomas Cook, *Sawyer.*
Thomas Hupell, *Yeoman.*
Thomas March, *Carpenter.*
Richard Bunner, *Yeoman.*
William Willing, *Do.*
Michael Osborne, *Do.*
John Murch, *Do.*

N° III.

ENGLISH OPIUM.

The Sum of THIRTY GUINEAS, *being the Premium offered, was this Session given to Messrs.* COWLEY & STAINES, *of Winslow, Bucks, for* 143 *pounds of* OPIUM, *of excellent quality, collected by them, from about eleven Acres of Land, planted with the Papaver Somniferum. The following Communication has been received from them on the subject, and a Sample of the Opium remains in the possession of the Society.*

Winslow,
March 29, 1823.

SIR;

WE have inclosed a specimen and testimonials to exemplify the quality, and certify the quantity, of opium which we obtained last year from about 11 acres of land, which we request you to lay before the Society.

The method of cultivating the poppy and extracting the opium, differed in no respect from that employed in the preceding year, the account of which is already in the possession of the Society: the only circumstance worthy of notice is, that the collection of opium was begun on June 26th, and finished July 13th, being more than a month earlier than the usual period; this was attributable to the dryness of the season, as was also the deficiency of the produce which fell below the average quantity. Some compensation, however, was made for the deficiency by an abundant crop of turnips which succeeded the poppies.

We are, Sir,
&c. &c. &c.
COWLEY & STAINES.

To A. Aikin, Esq.
Secretary, &c. &c.

CERTIFICATE.

Winslow, Bucks,
29th March, 1823.

I HEREBY certify, that Messrs. Cowley and Staines collected 143 pounds of opium in the last season from 11 acres and 5 poles of land.

JOHN KING, *Land Surveyor.*

Winslow, Bucks,
29th March, 1823.

THIS is to certify, that Messrs. Cowley and Staines obtained 143 pounds of opium from poppies of their growth, during the season of 1822.

WILLIAM GRANT.

2, Newman's Row, Lincoln's-Inn-fields,
March 27th, 1823.

SIR;

I BEG leave to state, for the information of the Society of Arts, that, for the last six months past I have used the British opium produced by Messrs. Cowley and Staines, of Winslow, in the year 1822, and am satisfied that both its purity and medicinal properties are, in every respect, equal to those possessed by the opium produced by the same gentlemen in the preceding year.

I am, Sir,
&c. &c. &c.
T. CLARKE, *Surgeon.*

To A. Aikin, Esq.
Secretary, &c. &c.

Nº IV.

ENGLISH OPIUM.

The LARGE SILVER MEDAL *was this Session given to* J. W. JESTON, *Esq. Surgeon, of Henley on Thames, for his Improvements in the Method of collecting* ENGLISH OPIUM. *The following Communication has been received from him, and Specimens of the preparations mentioned therein are placed in the Society's Repository.*

Henley on Thames,
Jan. 30, 1823.

SIR;

HAVING lately been informed that the Society for the Encouragement of Arts, Manufactures, and Commerce, had offered premiums for promoting and improving the cultivation of the papaver somniferum, you will oblige me by submitting to the members of your Society the present communication, which, although it does not come within the conditions of the premium this year offered, on account of the small scale on which my experiments have been conducted, yet I am induced to offer to the Society the method I have adopted in collecting opium, with a view that it may prove useful to those persons who are cultivating this plant more extensively. The plan of collecting the poppy juice immediately that it exudes from the capsule I have tried for three years and find it expeditious and effectual. I have added a comparative analysis of

English and Turkey opium. In the box will be found two cakes of opium, collected this last season; the scarification-scoops and bottles used in collecting; also some specimens of morphine, of narcotine, and of a very tenacious adhesive matter, &c. extracted from English opium. Allow me to add that I have tried, and now use, the English opium medicinally in my profession, and find it rather stronger and more certain in its operation than the best Turkey opium.

I remain, Sir,
&c. &c. &c.
J. W. Jeston, *Surgeon, Henley, and H. P. 36th Reg. of Foot.*

To A. Aikin, Esq.
Secretary, &c. &c.

In April, 1816, I prepared a quarter of an acre of land in Warwickshire, by having it divided into beds, four feet and a half wide, with a foot and a half for path-ways; these I had planted with several varieties of the papaver somniferum; the seed was mixed with ashes, in the proportion of four ounces of seed to the bushel; each bed contained seven rows of plants, nine inches asunder. The plants blossomed the end of July, and the capsules were not fit for scarifying till the middle of August. The season being extremely wet, and having been disappointed in some former experiments in gathering the opium in the usual way by allowing the juice to be inspissated on the capsules, I now tried a new method of collecting the milky tears, for which purpose I employed for my scarificator an inch and six-eighths of an old watch-spring, sharpened at both extremities, and on the four sides: this I thrust through a slice of a large wine cork, to the depth that I wished to have the heads scarified, and on one end becoming blunted, the other extremity, on being set to a proper depth, might be used; by this means I had the advantage of four scarificators. My collector consisted of a tin scoop, two inches and three-fourths in length, and half an inch in diameter, fixed, with a little tow and wax, into the mouth of a strong ounce-and-a-half or two-ounce phial. Armed with this scarificator and collector, I found that I could collect from one to two ounces of the milky tears of opium in the hour. My plantation consisted principally of the semi-double purple and white, the red and double varieties producing very little juice. I employed one boy daily, from August to the end of September, during which time it rained more or less every day. The quantity of dried opium collected by the boy and myself was two pounds six ounces, and 120 pounds of seed. Having ascertained by this experiment that the white and semi-double purple were the only varieties worth cultivating, and that the sooner the seed was sown in the Spring the greater the number of capsules, I, in 1821, repeated my experiments in Oxfordshire; I prepared a quarter of an acre of land by dividing it into beds as before, the land being of a light gravelly soil and poor. I this year prepared my seed by mixing four ounces of nitre in fine powder and the same quantity of seed with a bushel of ashes, and had it planted in February, by women, with blunt dibbles, five rows to a bed. The seed vegetated well. I found the worms very destructive to the early plants; but having sown a superabundance of seed (two pounds to the quarter of an acre) I secured a good crop: I had them twice thinned out, and hoed to a foot distance between every plant. They came into blossom in June, the season being favourable, with occasional showers. I employed one or two boys from the middle of July to the 10th of August. The plants had most of them from three to six capsules, and some more. I found the following plan very expeditious in collecting the juice:—As soon as the capsules were half grown, two boys, each provided with a scarificator and scoop, taking a bed between them, scarified from ten to twenty heads, making a horizontal incision half round the upper part of the capsule; they then began to scoop off the juice, which flowed immediately, and which, if allowed to remain but a few minutes, would run off in large drops on the ground. The juice readily runs down the scoop into the bottle, which, on being filled, the scoop, after having the inside of the tube scraped out, is removed to a fresh bottle. By this mode, excepting during heavy rains, the boys can be employed collecting the whole of the day. The least adulteration of the juice is easily detected, the pure milky tears, on being emptied from the bottles, being of a white solid mass; if water or any other fluid is mixed with it, it is more or less brown, and the opium in the bottles remains liquid. I paid the boys 8*d.* per day, and gave them 1*d.* extra for every bottle of opium collected; and from this *encouragement-money*, I found the two boys did not require my constantly looking after them. The following table will show the details of each day's collecting:—

		Bottles.		Ounces of Opium.
July 18,	one boy collected	4	containing	6
19,	two boys do.	9	do.	13½
20,	do.	10	do.	15
21,	Wet all day.			
22,	Sunday.			
23,	Two boys do.	13	do.	19½
24,	do.	12	do.	18
25,	do.	11	do.	16½
26,	do.	10	do.	15
27,	A wet day.			
28,	One boy do.	5	do.	7½

		Bottles.		Ounces of Opium.
29,	Sunday.			
30,	A wet day.			
31,	One boy collected	5	containing	7½
Aug. 1,	do.	4	do.	6
2,	do.	4	do.	6
3,	do.	4	do.	6
4,	do.	3	do.	4½
6,	do.	3	do.	4½
8,	do.	3	do.	4½
10,	do.	2	do.	3
16 Days		102 Bottles		153 Ounces,

or 8 pounds 15 ounces of recent opium, which, when dried, afforded 5 pounds 9 ounces of very pure opium; each head was scarified three or four times, or as long as they would bleed; and on going over the beds the second, third, and fourth times, there were many fresh capsules from the side shoots to scarify; also a quantity of dried opium was frequently collected, which had exuded after the former gatherings. Scarifying the heads too deep destroyed the seed, also the further supply of opium. I collected 170 pounds of seed in August, and extracted 30 pounds of extract from the dried capsules. I found two boys quite sufficient for the quarter of an acre. For the nitre I gave 6*d*. per pound, and used it at the rate of 8 pounds to the acre, besides ashes.

My experiment of last year did not succeed so well, owing to the dryness of the season and lightness of the soil. In February, 1822, having prepared an acre of ground by dividing it into beds of five feet width with the plough, I had it sown broad-cast with 8 pounds of seed, mixed with nitre and ashes, and raked in. The seed came up well, and very thick; but, owing to the great mildness of the preceding winter, the slugs and worms destroyed the greatest part of the crop. The beginning of April I had it sown a second time, and this also failing, owing to the great dryness of the season, I planted half the ground with potatoes, which produced a tolerable crop. The poppy plants which succeeded grew this season from two to three feet high, and had not more than two or three capsules, whereas some plants that had stood the winter, had from six to ten capsules, growing from five to six feet high; they came into bloom in May, and afforded a very abundant supply of opium, clearly proving the advantage of the autumnal sowing. The following table will show the quantity of opium that was collected from this acre, and the short time which it produced opium. The plants came into blossom the middle of June, and I began to collect the opium on the 28th.

1822,		Bottles.		Ounces of Opium.
June 28,	Three boys collected	15	containing	22½
29,	Four do.	23	do.	34½
30,	Sunday.			
July 1,	Four boys do.	26	do.	39
2,	do.	15	do.	22½
3,	Two do.	12	do.	18
4,	do.	11	do.	16½
5,	Wet.			
6,	Two boys part of a day	7	do.	10½
7,	Sunday.			
8,	Two boys collected	10	do.	15
9,	One boy do.	5	do.	7½
10,	do.	5	do.	7½
11,	do.	4	do.	6
12,	do.	3	do.	4½
13,	do.	2	do.	3
13 Days collecting		138 Bottles		207 Ounces

or 12 pounds 15 ounces of recent opium, which, when dried, produced 8 pounds 5 ounces of fine opium, and cost 1*l*. 10*s*. 2*d*. in collecting. It will appear from the above statement, that four boys were too many, after the first three or four days, for the half acre; the plants not being very numerous, they went over them in less than two days, I consequently, discharged two of them. One of the boys collected the first day he was employed nine ounces, and the second day eleven ounces, and had there been a sufficiency of plants the boys would every day have collected a larger quantity of opium from becoming more expert at it: the boys received the same encouragement-money as before. Every evening the bottles that were collected during the day were emptied into shallow tin pans, 14 inches by 10; these I placed in the garden, sheltered from the rain, and, by stirring the opium once or twice a day, it soon dried sufficiently to be formed into cakes of two pounds weight each. After the opium had been in the pans a few days, they were placed one over the other, cross-ways, by that means taking up very little space, and having a current of air between each pan. I found the leaves of the large palmated rhubarb a very clean and convenient covering for the cakes, which by preventing them sticking together allowed of their drying sooner. One pound of the poppy-juice I dried over a water-bath. Although the opium was quite thick before heat was applied, it soon became fluid and watery, and afterwards dried up into a very dark brittle mass. By attending in the field occasionally myself, I found that there was one variety of the white poppy with high crowns and smooth capsules, growing from 4 to 12 heads, and producing a much larger quantity of milky tears than the common white poppy: the seed of some of these I have selected for my future experiments.

I am inclined to think that there is still much information to be gained before the cultivation of this important plant can be brought to perfection in this country, in selecting the seed, the best time for sowing, and the preparation of the soil; but I hope that the encouragement that has been given by your very excellent Society will soon surmount all difficulties. The poppy has a tap root, is a very hardy plant, flourishing best in a loamy soil. Last September I had two acres drilled with poppy seed, the rows rather more than a foot apart, and although the plants are small, yet the severe frost has not apparently injured them. I am now trying the effect of ashes, lime, and nitre, and short stable dung, as top-dressings to three different parts of the field. There is a double advantage in having an autumnal as well as a spring crop, by allowing a longer period for the collectors to gather the opium. The produce of the last crop, besides opium, was 320 pounds of seed, which, on being pressed, will give from 12 to 13 gallons of oil, and 180 pounds of oil cake. I have found the poppy stems useful in lighting fires, 1,000 pounds of stems producing 95 pounds of ashes, and 7 pounds of potass mixed with sulphate of potass; the residuum consisted of 5 parts calcareous matter, and one of silex, carbon and insoluble substances.

The following analysis was undertaken to ascertain if any difference existed between the best Turkey and English opium, and in what that consisted. After many experiments for the last two years, which I feel much pleasure in laying before the members of the Society, I find that England need no longer be indebted to Turkey, or the East Indies, for this valuable drug, her own soil and clime being capable of producing poppies containing all the active ingredients of the very best Turkey opium.

In my analysis I found English opium contained a larger quantity of morphine, or gummy extract, and of narcotine, or resinous extract, but a much less quantity of the inactive ingredients, viz. ceroma, or waxy principle (soluble in boiling spirits, and separating from it whilst cooling), and a very adhesive, tenacious matter, insoluble in spirits of wine, but readily so in æther and the essential oils, resembling in many of its properties caoutchouc. The insoluble remains of Turkey and English opium, consisting of gluten and earthy matter, are much the same.

The opium which I used for my experiments was thoroughly dried, and in powder, common opium losing from 40 to 60 grains in an ounce whilst drying.

The insoluble matter was collected and weighed very exactly in these experiments, for I frequently found much difficulty in reducing the extracts to the same exact degree of dryness; and sometimes they would exceed the original weight of opium when added to the insoluble parts, owing to a small quantity of moisture being still very tenaciously retained, even when reduced to powder, which gave the result the appearance of being incorrect.

EXPERIMENT THE FIRST.	ENGLISH OPIUM.	TURKEY OPIUM.
	Grains.	*Grains.*
480 grains (one ounce) of Opium, in powder, was dissolved in two pints of cold water; after macerating for several days, it was strained, and the residue was repeatedly boiled in fresh water, till the fluid passed the filter colourless: on evaporating these different fluids and drying the extract, I obtained	360	334

	ENGLISH OPIUM.	TURKEY OPIUM.
Whilst this watery infusion was evaporating, a quantity of resinous lookng matter separated, and subsided to the bottom of the pan in the form of very minute crystals.	*Grains.*	*Grains.*
The residuum insoluble in water was boiled in three ounces of spirit of wine, and filtered; on cooling, it deposited several grains of ceroma, of a light yellow colour, tasteless, and of the consistence of butter. This I separated before the fluid was quite cold, to prevent its adhering to the crystals, which soon began to shoot from the sides of the bottle, and which continued to enlarge for several days. On more spirit being boiled with the residue, it still deposited ceroma, but the fluid did not afford any more crystals.	120	146
The spirit dissolved of ceroma	5	4
Of resinous extract in crystals	7	Not any.
Of resinous matter not easily crystalised	42	47
The insoluble residuum, on being dried, weighed	66	95
and possessed the singular property of becoming highly electrified, on being rubbed in a mortar; so much so, that it was with some difficulty collected together again: this property was destroyed by boiling it in oil of turpentine, which dissolved of a substance like caoutchouc	21	41
Leaving a light brown, earthy, insoluble powder, weighing	46	54
A paper of this powder was folded together, and placed on a stove to dry; before the covering was much scorched, it took fire, and burnt like pyrophorous made from alum and carbon, spreading an intolerable stench of burnt horn or animal matter.		
The extract of 360 grains, obtained by evaporating the watery solution was mixed with three ounces of æther, one ounce being digested on it at a time; the two first quantities deposited crys-		

	ENGLISH OPIUM.	TURKEY OPIUM.
	Grains.	*Grains.*
tals on the sides of the bottle; the third did not; the æther, on being evaporated, left a mass of narcotine ……………………	34	20
which, on dissolving in spirit, produced fine crystals.		
The remaining gummy extract consisted of pure morphine, and weighed …………	326	314
EXPERIMENT THE SECOND.		
480 grains of Opium, in powder, was dissolved in one pint of rectified spirit of wine; after macerating several days, it was strained, and fresh spirit boiled with the residue, till the spirit passed the filter tasteless: it dissolved ……………………	384	366
Leaving an undissolved residuum of ………	96	114
This residuum boiled in water, dissolved of gummy extract ……………………	23	25
Leaving a Residuum of …………………	73	89
The residuum of 73 grains was boiled in oil of turpentine, and the insoluble matter, after having been separated from the oil and dried, weighed …………………………	32	52
EXPERIMENT THE THIRD.		
480 grains of Opium was digested in 13 ounces of proof spirit, and strained; fresh quantities of proof spirit were boiled with the residuum as long as it appeared to take up any of the opium: it dissolved …………	388	366

	ENGLISH OPIUM.	TURKEY OPIUM.
	Grains.	*Grains.*
Leaving a residuum of	92	114
On boiling the residuum in oil of turpentine, it dissolved	54	74
Leaving a residue of insoluble matter	38	40
And in one specimen of very fine Turkey Opium, proof spirit dissolved 360 grains, leaving a residue of 120 grains, of which oil of turpentine dissolved 90 grains of this caoutchouc substance, leaving only 30 grains of insoluble matter.		
In making the tincture with opium that had been dried over a water-bath, proof spirit dissolved	320	
Leaving a residue of insoluble matter	160	
This tincture was placed on a warm stove whilst making, and on cooling it deposited the specimen of impure narcotine crystals sent for examination.		

EXPERIMENT THE FOURTH.

	ENGLISH OPIUM.	TURKEY OPIUM.
480 grains of Opium, in powder, was macerated in two pints of common distilled vinegar; fresh quantities of acetic acid were boiled with the residuum till it passed the filter colourless: it dissolved	388	348
Leaving a residuum of	92	132
Oil of turpentine, being boiled on this residue dissolved	46	88

	ENGLISH OPIUM.	TURKEY OPIUM.
	Grains.	*Grains.*
Leaving a residue of gluten and insoluble matter of	46	44
The acetate of opium was saturated with water of pure ammonia, and produced a grey precipitate of narcotine, very slow in subsiding to the bottom of the bottle, weighing	104	64
On re-dissolving it in spirit of wine, very fine crystals are deposited from it whilst cooling.		
The fluid, after separating the narcotine, is not easily evaporated to dryness, but contains of morphine, or gummy extract	284	284

Five grains of narcotine may be obtained from every ounce of English tincture of opium by mixing an equal quantity of water of ammonia with it. It may also be obtained by boiling spirit with the residuum after making the tincture of opium. It appears to contain powerful properties; the crystals are very light, and on opening papers of them incautiously, I have found them occasion a peculiarly unpleasant sensation in the nose and throat.

Narcotine is sparingly soluble in boiling water, but readily so in æther, the essential oils, boiling acetic acid, and spirit of wine, which on cooling affords a portion of the resin in fine white crystals, which appears to be the resinous part of opium, quite pure, and unmixed either with the ceroma or caoutchouc; a small quantity of these substances, particularly the ceroma, converting the crystals into a resinous mass, not easily again crystallised. Its solution does not perceptibly affect turmeric paper; but litmus paper, that has been soaked in weak solution of potass or lime-water, is slightly reddened, in the same manner as by the tincture of benzoin. Tolu, shell lac, mastic, and some other resinous tinctures which I have tried, alter the colour of litmus paper. I obtained the same results with æther and spirit, but I used the oil of turpentine in these experiments to save the great expense attending the repeating them frequently with spirit. On evaporating the oil of turpentine it left the caoutchouc-substance of the appearance of a very tenacious bird-lime, entirely soluble in æther.

The morphine I have given medicinally with the happiest results. Many persons who from some peculiarity of constitution could not take laudanum have derived much benefit from this preparation, without suffering the usual unpleasant effects from opium. I find one grain of morphine is equal to one and a half of common opium.

I have adopted the terms morphine and narcotine from having met with them in a paper in the Medical Records for June, 1821, wherein Robiquet has called the gummy extract *morphine*, from supposing it contained the anodyne and composing principles; and the resinous, crystalline mass, *narcotine*, from possessing the stimulating and stupifying principle.

I have to apologize to the Society for having occupied so much of their valuable time; but I trust that the importance of the subject will be a sufficient excuse.

I am, &c. &c.

J. Ward Jeston, *Surgeon, Henley,*
and H. P. 36th Regt. of Foot.

[The wood-cut here annexed represents the scoop and bottle mentioned in the former part of this communication.]

CERTIFICATE

Henley on Thames,
Jan. 28, 1823.

DEAR SIR;

I FEEL great pleasure in stating I frequently visited your plantation of poppies during last summer, and that I saw and much admired your very simple, but excellent plan of collecting the opium from the plants.

I am, Sir,
&c. &c. &c.
PARIS DICK, *M. D.*

To J. W. Jeston, Esq.

N° V.

EARLY HORSE-BEANS.

The LARGE SILVER MEDAL, *being the Premium offered, was this Session given to* W. PYLE TAUNTON, *Esq. of Cheam, for an* EARLY VARIETY OF HORSE-BEAN. *The following Communications were received from him on the Subject.*

3, Pump-court, Temple.

GENTLEMEN;

PERCEIVING that you have offered a premium for the cultivation of any species of beans which shall be cleared off the ground, ripe, before the middle of August, I take the liberty to submit to your consideration my humble pretensions as a claimant of that premium, in respect of the cultivation of the winter bean; a variety which I have not met with in England, in the hands of any other agriculturist; nor can I inform you of what country it is a native. I derive my stock from so small a quantity as a pint, communicated to me by a friend on the continent about six years back; from which small beginning I have gradually extended my stock until I could make this variety the subject of field culture Its properties are, that it is a small, firm, plump, and heavy seed; that the plant is very productive and very hardy; that it ought to be sown in Autumn, and that it admits a very considerable latitude in the time of sowing; inasmuch as I have had the finest of produce from the ripened seed which has shed itself in July, and have also had it succeed well, though sown late in November; but the time of sowing to which I should give the preference is, the month of October; that if the land be properly relieved from stagnant water the young plant bids defiance to all the frosts of winter, even in the coldest and wettest clays; and that if, as I have sometimes seen it happen, after the bean has renewed its growth in Spring, and made considerable progress in fresh vegetation, a severe honeycomb frost, attended with alternate thaws, cuts its tender shoots, the plant indemnifies the farmer, by tillering out with increased vigour from the roots, which I have never known to be affected by the vicissitudes of the weather. Indeed, in all circumstances, this variety tillers out very freely; insomuch that, in 1821, where I had drilled only 7 gallons of seed on 5 roods of ground (which is only after the rate of 5½ gallons to the acre) at intervals of eighteen inches between the drills, I found that the plants were thicker than was consistent with a full crop of grain. They are very prolific, and I have always had abundant reason to be satisfied with their produce, until the present year; but the extraordinary mildness of the last Winter having caused all the beans which I had sown in September to blossom in March, and the beginning of April, some cold weather which subsequently ensued, prevented the earlier blossoms from setting, and caused a considerable degree of blight, which I had never before experienced; and a small quantity of ground, not exceeding 31 rods, which I sowed during the month of November, proved much more productive than any of those which I had sown earlier. I have, in every instance hitherto, in the climate of Surrey, where alone I have tried these beans, had them all harvested before the last day of July, and the seed has always then been hard, dry, and bright.

A bean possessing these qualities appears to promise the following important advantages to the cultivator. In a season when beans are scarce, it may be thrown into the market in the end of July, or beginning of August; and inasmuch as it greatly resembles an old bean in its hardness and dryness, it may reasonably be expected to obtain a price nearly approaching to the price of old beans. No competition can at that time be apprehended from new beans of the varieties usually sown, for they are at that time still growing, and in an unripe state. Next, the Winter bean being ripened in the heat of Summer yields to the flail as soon as it is carried from the field, whereas the later varieties, coming to maturity only under the weaker and more uncertain suns of Autumn, require to be kept longer in the stack or barn, to dry, before they will readily thresh. The farmer, therefore, can convert the produce of this variety to money, on an average, three months earlier in the year than he can the produce of the ordinary sorts. Next, the weight, plumpness, and hardness of the sample, will at all times recommend it, and ensure a superior price. But the greatest advantage which it offers to the agriculturist, above all, in those rich soils which permit the long-continued alternation of wheat and beans, such as the vale of Pewsey, the vale of Evesham, and other highly-favoured districts, is this, that after this bean-crop is harvested, there still remains enough of the heat of Summer, to give to the land which has borne it a very effective fallow before the season requires the succeeding crop of wheat to be sown. If, in 1818, or in 1822, the plough had been put into the foulest and wettest ground, on the 20th of July, at which time my beans were cleared, or even within a month after that time, there was sufficient subsequent heat and drought to have roasted and killed every weed, and to have so completely dried and contracted the toughest clay, that upon the first succeeding rains it should all have shivered into the finest tilth, perfectly clean, and ready to receive wheat, or any other seed; whereas, in the ordinary course of bean-culture, the beans often are scarcely got off in time to plough for wheat; and the land is then frequently so foul as to be unfit for any crop at all, without an intervening fallow.

I have found this crop well-adapted for sowing therewith the seeds of perennial grasses for permanent meadow. I feel called upon to make a remark on the quantity of land which I have this year sown with these beans, and which I humbly conceive ought to be considered as amounting to the extent (five acres) which the Society has required. The largest of the fields, called Claypond-field (10 acres, 1 rood, and 20 perches), which was actually sown with them, at intervals of 12 feet between drill and drill, will not, probably, be considered by the Society as a space of 10 acres fairly cropped with beans; but it may with propriety be considered, that an interval of three feet between the rows is a proper and husbandlike distance for the cultivation of beans, especially since the crop sown at 18 inches was found to be too closely sown; and if this be allowed, then the same number of rows of beans which were spread over 10 acres, 1 rood, 20 perches, at 12 feet interval, will, at an interval of 3 feet, cover 2 acres, 2 roods, 15 perches.

	a.	r.	p.
Let Claypond field, therefore, be considered as ...	2	2	15
In West-London-lane field the beans were	1	1	26
In Ruffett field the beans were	1	1	0
In Peach's close I had of these beans	0	0	31
And the total area of the beans will be	5	1	32

thus exceeding the quantity which the Society requires.

I have the honour to be, Gentlemen,

&c. &c. &c.

W. Pyle Taunton.

SIR;

Your favour of 30th April was mis-sent to Staines, or it should have received my earlier attention.

With respect to the expense of the culture of the Winter-beans, my answer must, to a certain degree, be hypothetical; because, in the year in which the crop grew whereof I have sent you a sample, the beans were not my primary object; but my primary object was, the reducing of a stiff, sour, clay land to permanent meadow (a subject to which I have given many years attention, with the most satisfactory results), and I only combined the beans with that object, because I wished to increase and propagate the beans, and had no other ground ready to take them. The course of crops in Claypond field (where the beans stood at 12 feet interval between the rows, for the several preceding years since I first occupied the land, was—

Harvest 1819.—Wheat; dunged for

Harvest 1820.—Tares, fed off with sheep, intended to be sown to grass in August, but the showery weather prevented my getting the land fine enough for grass that year; wherefore, I again sowed for

Harvest 1821.—Tares, fed off with sheep; and in September, 1821, sowed it with grass and beans at 12 feet interval, thinking to steal from the grass a crop of beans, which, at this wide interval, would not hurt the grass. I am of opinion that the excess of manure in this field, which would have been beneficial to the grass, assisted to force the growth of the beans prematurely, and also to prevent their maturing their seed, and to render them more obnoxious to the blight. As I had high narrow ridges of old arable to level in this as well as in all my fields, before I could bring them into a fit state for a meadow, I ploughed, in the Summer of 1820, six or seven times, to level the ridges, and in Summer 1821, I ploughed about three or four times; viz. half the ground three times, half four times, besides many harrowings; my object being to produce for the grass as fine a tilth as possible (which is indispensable for the purpose of creating meadows in the best manner); but for the beans only, had they been my principal object, I would not have given more than a single ploughing, and much less manure. The committee will observe, that the beans in Ruffett field were the very worst of my whole crop.

The piece of land in West-London-lane field, which bore beans, was thus cropped;—

Summer 1819.—An imperfect Summer fallow, I not having time to spare to it from other objects.

Spring 1820.—Cales; viz. chou cavalier, chou caulet de

Flandres, chou moëllier, and chou mille-têtes, mixed, in drills, at 2 feet, 4 inches: dunged for

Harvest 1821.—The same (after being cut for sheep in the Spring, and carted to a distant meadow) stood for seed, and produced a crop.

1822.—The same (having been once or twice ploughed between the drills in the Autumn and Winter) were fed off by sheep in the Spring; their gnawing of the bark of the stalks killed many plants; the others stood and perfected a second crop of seed in Summer 1822; after which, about three or four ploughings were given to level the ridges, with a view of sowing grass thereon; and cocksfoot (dactylis glomerata) was accordingly sown in September, 1822, as soon as the beans had been sown and harrowed in. It will be observed, that no manure was applied to this, except the original dunging for the cabbages in Spring 1820, and the droppings of the sheep, in April 1822, which may be conceived to be nearly counterbalanced by the scourge of a crop of cabbage carted off, and 2 crops of cabbage seed, so that no particular indulgence in point of manure can be said to have been shown to this crop; and this crop, the Society will be pleased to remember, was better than that in Ruffett field, but still was a bad crop, being too early, and thereby blighted, and also being a good deal shaded by hedge-row timber. Had it been my object to sow beans only I certainly should have given only one ploughing for them.

The land in Ruffett field was thus managed:—

Harvest 1819.—An imperfect Summer fallow.

Harvest 1820.—Scarlet-robe potatoes, with dung.

Harvest 1821.—The ridges ploughed down, and levelled by three ploughings and five harrowings, and sown in September with beans and cocksfoot grass.

This cocksfoot proved an excellent plant, and is now as good a piece of perfectly clean cocksfoot as any within fifty miles of London, the ground having been sufficiently fine when it was sowed.

The committee will perceive, that the circumstance of sowing grass with the beans entirely precluded hoeing in all of these instances, and that the produce might have been reasonably expected to be more advantageous, if hoeing had been performed.

The beans which grew in the turnip-loam soil, called Peach's close, grew on land dug by the spade, under the following circumstances:—Peach's close is my experiment-ground, in which I have under cultivation between two and three hundred different species of plants, with a view to the improvement of agriculture; and many of them, particularly the gramina, are disposed in square beds of a rod each, with an alley of the width of three feet in every direction between bed and bed, which serves as a path. The whole of the ground on which these beds are situate, in the Autumn of 1819 was sown, part with Winter peas, part with Canada tares, succeeded by stubble-turnips, which were poor; after which crops, in the Autumn of 1820, I ploughed the land deeply, and repeatedly, say three or four times, dunged it well, and laid it out in beds; and in September, 1820, sowed it with sundry grasses. Not to waste the space of the alleys, in the first year, while the grasses in the intermediate beds were in their infancy, I sowed some part of the alleys, in Autumn 1820, with various annuals, and among others, with Winter beans. In Autumn, 1821, I sowed nearly the whole of the same alleys, and also some of the square rod-beds where the grasses had failed, with Winter beans, and these were the beans which I harvested there in 1822, as mentioned in my memorial: upon which I have to observe, that I perceived, in many instances, that dropped beans from the preceding harvest fell upon pathways and corners, and on beds which had never been dug at all in that year, and came up, and grew quite as well, and bore as well, as the crop on the ground which had been prepared by digging: part of the beans in the alleys and beds I hoed in March, part was neglected and never hoed at all, and they had to contend with a numerous and luxuriant host of annual weeds. The beans in Peach's close were the best I had in that year, as I have before observed. My digging in that field was done at the rate of 3*d.* for some, and 4*d.* for others, per square rod, varying according to the degree of drought and hardness of the ground; and the beans were dibbled in by a boy, who fed my pigs at his vacant hours; his day work cost me 6*s.* per week, and I suppose he wasted 3 or 4 days in dibbling these beans, which might have been done in one. The alleys between the beds, being more trodden and hard, I paid in some weather 3 farthings, and in other 1*d.* per rod, run, for digging them, or 4*d.* and 5½*d.* respectively per rod square, which was rather too much; but the finishing the work so as not to entrench on the boundary of the bed on both sides required more time and care than straight-forward digging does.

In the present year I observe that the scattered beans dropped in the last harvest on the surface are come up, and look as hardy, healthy, and forward, as they need to do; whence, as well as from the other premises, I draw the conclusion, that these, like other hardy small horse-beans, require not an expensive tillage; that one ploughing, and two or three turns, or tines of the harrow, to cover them, would be quite sufficient to ensure a crop. And I would make the following estimate of their culture, according to the practice I should pursue, looking to the bean-crop only, and not looking to the future melioration of the soil, for the purpose of bearing grass or wheat: —

	£.	s.	d.
In stiff clay land, one ploughing, per acre	0	17	0
Drilling beans per acre, with Smyth's drill, 4 horses, drill-man, and driver, at 4*s.* per acre ...	0	4	0
Three tines of the drag, or harrows, at 8*d.*	0	2	0
Water-furrowing, say per acre........................	0	1	0
Bird-scaring 3 weeks, say per acre..................	0	0	9
2 hoeings in Spring, *i. e.* end of March, and end of May, the two, per acre	0	8	0
	£.1	12	9

On my lighter land the ploughing would cost me 5*s.* per acre less, one tine of harrowing less, and no water-furrowing; thus reducing the cost of culture from 1*l.* 12*s.* 9*d.* to 1*l.* 6*s.* 1*d.* per acre.

If I were to make either a complete Summer fallow, or a partial Summer fallow, previous to my sowing the beans, I should be induced to debit in my ledger the succeeding crop with a part of the expense of such fallow, which the row-culture of the beans would enable me to keep clean during the succeeding Summer, so as to leave the ground in a very good state of preparation for wheat, or other Autumn-sown crops.

If the committee should not think that my division of the expenses between this crop and the succeeding crops is to be adopted, I must then submit to them the actual cost of the tillage on which they were sown, which, I conceive, stands as follows: —

	s.	d.
In Peach's close, digging per rod	0	4
Dibbling per rod (through the boy's idleness)	0	2
Hoeing per rod (where performed)	0	1
	0	7

The amount of spade culture, at this rate, would be per acre 4*l.* 14*s.* 8*d.* This small parcel was not watched to preserve them from the birds, therefore no cost thereof is charged here.

	£.	s.	d.
For that which I sowed in the fields; Ruffett, 3 ploughings, one at 17*s.*, two at 13*s.*..............	2	3	0
5 draggings and harrowings, at 8*d.*	0	3	4
Water-furrowing	0	1	0
(Bird-scaring was omitted, this piece being small.)			
Drilling beans, per acre	0	4	0
Harrowing in the same, two tines only, per acre...	0	1	4
Rolling three times with heavy stone-roller (this operation was performed purely for the sake of the grass), at 9*d.* per acre	0	2	3
Hand-weeding in Spring, per acre	0	2	0
	2	16	11
For the beans in Clay-pond field, must be added hereto, upon all the field, the further cost of bird-scaring	0	0	9
To which, add the preceding charge	2	16	11
	2	17	8
And on one half of the field, one more ploughing	0	13	0
Total.....	£.3	10	8

And in East-London-lane field the charge differs from the estimate in Ruffett field in this respect, viz.

Charge on Ruffett field … ………………………	2	16	11
Deduct 2 rollings, this having been rolled only once, at 9*d.* per acre …………………………	0	1	6
Total cost per acre………… ..	£2	15	5

But I beg leave to repeat, that I should have incurred, and did incur, the whole of these expenses at the same seasons, for the sole purpose of sowing my meadow grasses, even if I had sown no beans, the combination of which was an afterthought, and, for me, not a very happy one; for in two instances out of the three, namely, in Clay-pond field and West-London-lane field, where their growth was most exuberant, they injured the grass; in Ruffett field, where the land was less full of manure, grass succeeded most perfectly under these beans; and as the Autumnal sowing of grass is certainly the most advisable, I think I may venture to say, that with due precaution not to sow the beans too early, or too thick, they may form a useful means of lessening the expense of laying down perennial pastures or meadows in the best manner.

I have to regret that I was not aware that the Society wished for an estimate of the expense, or I would sooner have submitted it to them, and I hope the above statement will be found satisfactory.

In the pursuit of agricultural improvement, my researches have made me acquainted with several plants, which I cannot but esteem to be valuable acquisitions to our national stores. Among the cerealia, the Winter pea, St. John's rye, Spring rye, and Georgian oat, above all the others; among the Diadelphous plants, the hedysarum onobrychis biferum, or double crop saintfoin; the trifolium incarnatum; the bullock clover; trifolium macrorhizum; medicago maculata; and several others which promise valuable results, the qualities of which I have no time now to enlarge on: nor do I perceive any premiums held out by your Society which particularly call for the exhibition of them; but all of which, as well as the collection of about 200 various species of grass, I shall be happy to render subservient to the good of the community in any way I can most effectually do it.

I am, Sir,
&c. &c. &c.
W. P. TAUNTON.

A. Aikin, Esq.
Secretary, &c. &c.

CERTIFICATES.

I, **GEORGE HEFFER**, bailiff to William Pyle Taunton, esq., hereby certify, that the Winter beans which grew in a certain close of rich light loamy sand, called Peach's close, at Cheam, in the county of Surrey, being 31 square rods, were pulled by James Raissin and Walter Grig, on Wednesday the 10th, Thursday the 11th, and Friday the 12th days of July, 1822; that the Winter beans in Clay-pond field, ten acres, were cut by Thomas Harris, Isaac Purkiss, and William Edington, on Tuesday the 9th, Thursday the 11th, Friday the 12th, Saturday the 13th, and Tuesday the 16th, of the same month of July; that the Winter beans which grew in the West-London-lane field, being one acre and sixty-six rods, were cut on Saturday, the 13th of the same month, by Thomas Harris and Isaac Purkiss; and that the Winter beans which grew in Ruffett field, being one acre and one rood, were cut on Wednesday the 17th, and Thursday the 18th, of the same month, by Thomas Harris and William Edington, the said three last-mentioned fields being in the parish of Cuddington, in the said county of Surrey, and all the said fields being in the occupation of the said William Pyle Taunton, and that the whole of the said beans were perfectly ripe, hard, and dry, at the time of harvesting the same, and that the beans sowed at the interval of eighteen inches, in Ruffett field and West-London-lane field, were sown too close together, and that the crop would have been better if they had stood at wider distances, because they tillered out so much.

GEORGE HEFFER.

Cheam, Dec. 2, 1822.

I, William Neale, of Cheam, in the county of Surrey, farmer and land-surveyor, hereby certify, that on Monday, July 15, 1822, I inspected the crops of Winter beans grown in the three several closes, called Clay-pond field, West-London-lane field, and Ruffett field, in the parish of Cuddington, in the county of Surrey, in the occupation of W. P. Taunton, esq., and that the beans in the two first-mentioned fields were then ripe, and already cut and lying on the ground, and that the said beans in Ruffett field then appeared ripe and ready to be cut.

WM. NEALE.

Cheam, Surrey, Dec. 2, 1822.

I, John Andrew, ploughman to Wm. Pyle Taunton, esq., hereby certify, that in the year 1821, on Wednesday the 12th, and Thursday the 13th days of September, I drilled Winter beans over the whole of a close, called Clay-pond field, containing 10 acres, 2 roods, and 20 perches (except the north and south headlands, which are about a quarter of an acre) in single drills, at twelve feet distance between the drills; that, on Tuesday, September 18th, in the same year, I drilled Winter beans at the distance of a foot and a half between the drills, over a part of a close called Ruffett field, of the extent of 1 acre and 1 rood; and that on Friday, the 12th of October, in the same year, I drilled Winter beans at the same distance of a foot and a half between the drills, over 1 acre, 1 rood, and 26 perches, situate at the west side of a field called West-London-lane field, all which fields above mentioned are situate in the parish of Cuddington, in the county of Surrey, and then were and still are in the occupation of William Pyle Taunton, esq., and the soil thereof is of a stiff, wet, intractable clay.

The Mark of John Andrews ✕.

SIR; Cheam, April 4, 1822.

I HAVE the honour to inform you that I have this day, according to your request, weighed with accuracy a bushel of the Winter beans, and that the weight of them is 63¼ lbs. avoirdupois. I ought to add, that these are some of the beans which were last threshed, and which grew on the acre in Ruffett field, a crop which was less blighted than those I had the honour to send to the committee, the latter having been taken from those I first threshed, and which grew in Clay-pond field and West-London-lane field. I suspect that the sample I exhibited to the Society would not weigh quite so much.

With respect to the produce per acre, it has, in this last year, in consequence of the blight, been very unequal and less satisfactory than in any former year. As I did not keep the produce of the several fields distinct, I cannot take upon myself to speak to the produce per acre with perfect accuracy; but, to the best of my judgment, the one acre and a quarter in Ruffett field (which was sown the latest) produced to me 21 or 22 bushels; the few rods in Peach's close, on a drier soil, produced to me after the rate of about thirty bushels an acre. The produce of West-London-lane field and Clay-pond field suffered so much by the blight as to be very inferior, and did not, I think, much exceed a sack to an acre.

I have the satisfaction of stating, that after the late Winter (which, as the thermometer was several times many degrees below zero, must be thought a strong test for growing beans), I see the bean plants now about three or four inches high, bearing no other mark of the severity of the Winter than their having a brown and scorched edge round some of their lowermost leaves; and some which had lain in the ground during the winter, being sown in mid November, are, since the frost, come up perfectly healthy and vigorous.

I am, Sir,

A. Aikin, Esq. &c. &c. &c.

Secretary, &c. &c. W. P. Taunton.

PAPERS

IN

CHEMISTRY.

N° I.

PORTABLE ELECTRO-MAGNETIC APPARATUS.

The LARGE SILVER MEDAL AND THIRTY GUINEAS *were this Session presented to Mr.* JAMES MARSH, *of Rush-grove-place, Woolwich, for a* PORTABLE ELECTRO-MAGNETIC APPARATUS, *which has been placed in the Society's Repository.*

EXCEEDINGLY interesting and important experiments on the intimate connexion between electricity and magnetism, mark the principal track of philosophical investigation during the last four years. Professor Oersted, of Copenhagen, led the way and was followed with zealous emulation by M. M. Ampère, Biot, and Arago, in France; by sir H. Davy, Dr. Wollaston, Professor Cummings, Mr. Faraday, and Mr. Barlow, in England. The large and costly apparatus employed by most of these philosophers, necessarily restricted to a few persons placed in singularly favourable circumstances, the prosecution of these discoveries, and almost prevented the possibility of repeating the experiments on distant parts of the Earth's surface where the variation of terrestrial magnetism, as compared with that which takes place in our latitudes, may be expected to produce corresponding differences in the results. The mathematical laws of electro-magnetism as laid down by Mr. Barlow, however probable and consistent among themselves, would in particular derive great advantage from such investigations, as his theory of terrestrial magnetism already has, from experiments made by scientific officers on board his majesty's ships in different parts of the world.

Mr. Marsh, occupying a very subordinate department in the royal laboratory at Woolwich, was employed by Mr. Barlow as an assistant in his magnetic and electro-magnetic experiments. Thus favourably circumstanced, he was induced to turn his attention to the construction of an apparatus capable of exhibiting all the known facts of electro-magnetism, and of enabling the possessor to prosecute farther researches in this interesting and important branch of natural philosophy; while, at the same time, the portability of the apparatus and its moderate price, should place it within the purchase of most experimenters, and should peculiarly adapt it to the use of the traveller by land or sea. Having succeeded in his object, Mr. Marsh submitted his apparatus to the inspection and judgment of the Society, and before two numerous Committees, exhibited by means of it, with perfect success, all the facts of electro-magnetism which at that time had been discovered. The Society in recompence of the talents and ingenuity of the inventor, voted to him the reward specified above, and directed the insertion, in the next volume of their Transactions, of a description of the apparatus, conceiving it likely to be useful to private individuals, and to be peculiarly well adapted for service on board ship, in some of those naval expeditions for the promotion of science and general knowledge which so honourably characterize the present Board of Admiralty.

The whole apparatus is included in a box 14½ inches high, 15 inches broad, and 10½ inches wide, which when folded out forms a convenient table for the operator. Plate I, fig. 1, is a perspective view of the box ready for use, the flap *a* being raised up and supported by the leg *b*, which screws into it. The voltaic battery, with its appendages, occupies about half the box, and consists of a plate of copper, with a plate of zinc on each side. Figs. 3 and 4 are a front and transverse view of the battery; the two exterior or zinc plates are united at each corner by metal fastenings, and the intermediate or copper plate is cut away at the corners just sufficiently to prevent it from contact with the fastenings of the zinc plates, and is secured in its position by pieces of wood; *i i* are two copper feet upon which the battery rests when in action. Two brass pipes C and Z are soldered, the former to the copper plate, the latter to one of the zinc plates; they are intended to hold a little mercury for the purpose of forming a perfect connexion between the conductors C and Z, fig. 1, and the battery; in order still farther to secure the connexion, the ends of the conductors that are inserted into the pipes are first tinned and afterwards amalgamated, as well as the other ends on which the spiral wires, fig. 18, forming the poles of the battery, are fixed. The battery when not in use is lodged in the cell *e*, figs. 1, 2, which is lined with wood and varnished; the two jointed handles, by means of which it is raised, being laid down into notches cut in the partition between the two cells. The cell *d* is somewhat wider than the other, and is lined with sheet copper: into this the exciting fluid (dilute muriatic acid) is poured when the battery is intended to be put into activity, and the united copper and zinc plates being raised, by means of the two handles, out of cell *e*, are to be gently let down into the fluid, resting on the bottom of cell *d*, by means of the two copper feet *i i*, already mentioned. By this arrangement the battery forms a series of three copper and two zinc plates, the lining of the cell forming the two exterior copper plates, and consists of about eight square feet of metallic surface. Two pieces of varnished wood *g h*, fig. 2, are fixed to the sides of the cell to prevent the zinc plates from coming in contact with its copper lining. A small tray *f*, fig. 2, is placed on the flap *a*, in order to retain any fluid which may be accidentally spilled during the experiment.

Fig. 5, shows the general arrangement of that part of the box, covered by flap *a*, fig. 1, in which the different articles of apparatus are deposited. The lowest compartment, represented more at large fig. 6, contains a pair of horse-shoe magnets, a cylindrical magnet, a pocket compass, some spare copper wire, and two tin boxes, in one of which are contained iron filings, in the other spiral wires of iron, tinned and amalgamated. Over this is placed the lower shelf, figs. 7 and 8; the under projections of which secure in their places the articles already mentioned. The three upper shelves, figs. 10, 11, 12, are cut out in the forms represented, in order to admit in the most secure and compact manner, the various pieces of apparatus described and figured in Mr. Barlow's Treatise on Electro-magnetism, to which the reader is referred. Three, however, of these pieces of apparatus being the original invention of Mr. Marsh, are here represented.

Figs. 13 and 14 are the view and section of a central cylindrical magnet, having an agate socket inserted in each pole; on this socket rests a pivot having two branches of wire, by means of which, a hollow cylindrical cup of copper is suspended. In the copper cup is placed a cylinder of zinc also suspended by two wire branches, and balanced on the pivot *k*, which has free motion in a socket fixed on the wire by which the copper cup is suspended. Some dilute acid being placed in the copper cup, voltaic action is excited, and the copper cup will revolve slowly in one direction, while the zinc cylinder moves round in the opposite direction. By supporting this apparatus on the other pole of the central magnet, the motions of the copper and zinc will be reversed.

Fig. 15 exhibits a glass tube closed at its lower end, and passed through a circular piece of cork for the purpose of floating it, a voltaic combination is contained in the tube with which the spiral wire *l l* communicates; dilute acid being put into the tube, and the whole apparatus being floated in water, the spiral wire will place itself North and South in the same manner as a common magnetic needle will.

Fig. 16 is a stand with a long narrow reservoir for mercury, out of which rises a metallic pillar which supports a fine wire attached by a loop to the eye *m*: the lower end of the wire dips in the mercury, and, as well as the upper end, is amalgamated in order to render the contact more compleat. A horse-shoe magnet is then laid with a pole on each side of the trough, and as soon as the voltaic circuit is compleated, by means of the cups *n* and *o* filled with mercury, the moveable wire continues to leap out of the mercury, and to fall into it again in the direction indicated by one of the dotted lines. On reversing the poles of the magnet, the former motions will cease, and others similar to them will take place in the direction of the other dotted line.

Nº II.

MELTING POTS.

The LARGE SILVER MEDAL *was this Session presented to Mr.* HENRY MARSHALL, *of Newcastle on Tyne, for his improved Melting Pots for Brass Founders and other workers in Metal. Samples of the Pots are placed in the Society's Repository.*

LARGE earthenware crucibles (technically called melting pots) are used in great quantities by brass founders, steel melters, and other workers in metal. They are made in London, Birmingham, Sheffield, and other places; and their ingredients are tenacious refractory clay, together with fragments of earthenware made of the same or similar clay, reduced to powder more or less coarse according to the experience of the manufacturer. It is not necessary that they should be possessed of the highest degree of refractoriness, since the heat to which they are exposed is not so great, nor are the fluxes employed by the founders so active, as are necessary for the reduction of metallic ones to their reguline state. But it is especially expedient that they should be capable of enduring considerable changes of temperature without cracking or becoming unsound, as otherwise, each pot would not be capable of standing more than a single fusion. The common melting pots being made entirely of earthy ingredients, are very apt to crack, either if allowed to cool gradually after the first fusion, or if a second charge of cold or nearly cold material is thrown in while the pot remains in a heated state. The German black lead pots (or blue pots as they are called) contain a considerable quantity of plumbago in their composition, and hence will stand a greater number of fusions; but the cost of these is considerably greater than the common melting pots, and in time of war they are not always to be had.

Mr. Marshall's pots are made of a mixture of Stourbridge clay, potsherds, and pulverized coke, well incorporated together by beating; and instead of being *thrown* on the potter's wheel, the pot is made by pressing the above composition into a brass mould of the proper size and figure, by means of a core worked by a powerful screw press. Thus the vessel acquires a great and equal degree of solidity throughout, while the intermixture of coke with the clay, by giving a certain porosity of texture, renders it much less liable to crack, on transition from heat to cold, than those melting pots composed entirely of earthy ingredients.

The following certificates from founders of great respectability attest the goodness of the pots made by Mr. Marshall, and that the price of them is not greater than of those from other makers.

CERTIFICATES.

Gateshead, near Newcastle,
March 9, 1822.

SIR;

I HAVE for some time past used the improved earthenware crucibles made by Mr. Henry Marshall, of this place, and find them much superior to those I have formerly had from Birmingham and other places; I have them frequently in use a second day, which I never before could accomplish, and consider them in many respects equal to the black-lead pots; and come equally as low as the pots I have used generally.

I am, Sir,
&c. &c. &c.
JOHN ABBOT.

To A. Aikin, Esq.
Secretary, &c. &c.

No. 69, Red Lion Street, Clerkenwell,
March 21, 1822.

SIR;

OBSERVING the offer of a premium for improved earthenware crucibles, I beg to acquaint the Society that those made by Mr. Henry Marshall, of Newcastle-upon-Tyne, are much superior to any I ever saw, or used, for bearing great heats and standing changes of temperature without cracking; I use them frequently a second day, which I could not accomplish by any other make; in short, I conceive them superior to black-lead pots.

I am, Sir,
&c. &c. &c.
ROBERT BOWER, *Brass Founder.*

To A. Aikin, Esq.
Secretary, &c. &c.

February 15, 1822.

I CERTIFY that the large crucibles, with H. Marshall, Newcastle, pressed upon the edge, are the best clay crucibles I ever made use of.

H. VERNON, *Master of the Metal Mills,*
Portsmouth Yard.

SIR; Brownlow Street.

I BEG to acquaint you, for the information of the Society of Arts, that I am in daily use of Mr. Henry Marshall's crucibles, and find them of a very improved quality: I use them frequently two or three days, and, from having made use of the black-lead pots in my business, I now find that Mr. Marshall's are equal, if not superior, to them, and not higher in price than the earthenware crucibles before in common use.

I am, Sir,
&c. &c. &c.
A. HARCOURT, *Brass Founder.*

To A. Aikin, Esq.
Secretary, &c. &c.

46, 47, 48, & 49 Shoe-lane,
March 23, 1822.

THIS is to certify that we, the undersigned, can and do assert, from experience, that the melting pots manufactured by Mr. H. Marshall, of Newcastle, are superior to any we ever used, and that we have tried various other manufacturers pots, but give a decided preference to those manufactured by the above-named Henry Marshall.

WM. PONTIFEX, SONS, & WOOD.

Nº III.

IMPROVED APPARATUS FOR THE ANALYSIS OF ORGANIC PRODUCTS.

The LARGE SILVER MEDAL *was this Session presented to Mr.* J. T. COOPER, *of Paradise-street, Lambeth, for* AN IMPROVED APPARATUS FOR THE ANALYSIS OF ORGANIC PRODUCTS. *The following Communication has been received from him on the subject, and the Apparatus has been placed in the Society's Repository.*

AN easy and accurate method of determining the ultimate elements of bodies composed of carbon, hydrogen, oxygen, and azote, has been of late years a great desideratum among chemists, as such a variety of contrivances have been suggested by scientific individuals, all of which have their peculiar merits and defects. It is presumed the instrument and method of operating now presented to the Society and the public, if not entirely, may be considered as nearly free from those objections which in my opinion may be fairly urged against those heretofore in use. It might, however, be considered ungenerous, was I to take upon me the task of pointing out those defects, I shall therefore content myself by briefly stating in this communication, the class of substances to which it is applicable with a view to determining the proportions of their elements, and a description of the method of operating upon each of them.

As this apparatus seems more particularly calculated than any other for operating on volatile matter, such as the essential oils, camphor, benzoic acid, and a variety of similar substances, I shall in the first place describe the method I have adopted in the analysis of this class of bodies; and when it is considered that I write not for those who are accustomed to the more minute and delicate operations of chemical analysis, but for those who are or may be considered as unacquainted for the most part with this subject, I hope I may not be considered as tedious should I venture to give those directions which to the more matured in science may seem to be unnecessary.

The oxid of copper used in the experiments is best procured from the residuum of verdigris (binacetate of copper), which is or was used to be distilled in glass retorts for the preparation of strong acetic acid. The reason I prefer the oxid of copper prepared by this process over any other is, that it is more likely to be free from impurity than that which is prepared by precipitation from acid solutions. Every one who is in the habit of preparing precipitates, knows the difficulty there generally is in freeing considerable quantities of precipitated matter from adhering neutral salts; and as the smallest impurity would in some measure contaminate the result of the analysis, it is a very necessary precaution that the oxid, which is by far the greatest in quantity of any substance that is employed in the operation, should be perfectly pure. Should it however happen that at any time such an oxid is not readily to be procured, the oxid that is obtained by heating copper plate and quenching it in water may be substituted; although I give the decided preference to the former on account of its mechanical texture being much more porous, and consequently exposing a larger surface to the action of substances in vapour passing through it, neither is it so likely to choak up the tube and endanger its bursting, and of course a failure in the experiment. Supposing the residuum above mentioned to be employed, it is requisite to expose it to a red heat for twenty minutes or half an hour to destroy the carbonaceous matter that invariably accompanies it; it should then be pulverised and sifted through a fine wire sieve; that portion which has passed the sieve being again sifted through a fine cyprus or lawn sieve, the finer dust is got rid of, and each of these portions may be separately kept, and is applicable to different purposes.

A tube of hard glass, either of crown or green bottle glass, being selected about fourteen or fifteen inches long, and from one to two tenths of an inch internal diameter, clean the inside from dust by passing through it a piece of cotton, then make it as hot from end to end as the fingers can conveniently bear, and draw air through it into the mouth (but not blow through it) while it is still hot, to ensure its perfect freedom from adhering moisture on its inside, and while still warm seal up one end with the blowpipe; the tube may be now balanced, but it is necessary in this, as in all other operations of analysis where very small quantities are concerned, that the beam should be affected by $\frac{1}{100}$ or $\frac{1}{200}$ of a grain, even when loaded with 4 or 5 hundred grains at each end.* The substance intended for analysis is now to be introduced into the tube, if it be solid, as for instance camphor or a like substance, it may be broken into small fragments and shaken down to the bottom; if it be a fluid, as a volatile or fixed oil, it may be introduced by means of a small funnel, as is shown in fig. 7, which funnel is prepared, on the instant, from a piece of flint glass tube of convenient size and substance, by heating it near one of its extremities, and suddenly drawing it out, it is evident the semifluid glass will be thus elongated, and a funnel with nearly a capillary tube and of any required length, may be thus obtained; a very little practice will render this part of the business very easy to be accomplished; the funnel is to be put into the tube, reaching very near its bottom or sealed end, and the fluid matter introduced without soiling the upper part of it; care must also be taken on withdrawing the funnel, that no portion of the fluid is attached to its lower extremity, or otherwise this will happen. The volatile substance, or that which is capable of being rendered so by a red heat, being now introduced into the tube, its weight is to be very carefully taken, which when done the oxid of copper previously freed from its fine dust by the lawn or cyprus sieve* and recently heated red hot, is to be poured into the tube while warm, to the length of 8 or 10 inches, having previously put into the tube as much only of perfectly cold oxid as will absorb the fluid portion of matter, and about a quarter of an inch above it, or to stand about the same height above the solid substance. Why I recommend the present proceeding is, that a small quantity of the cold oxid only is used to prevent the hot oxid from coming in contact with the volatile matter which might otherwise endanger the escape of a small portion from the tube, and of course would give erroneous results; and that portion of cold oxid, even if it be fully saturated with moisture, can contain such a very minute quantity of water as not to sensibly affect the accuracy of the analysis. Having proceeded thus far, a quantity of recently-ignited asbestos, or spun glass (the former is best), is put into the tube, so as to occupy an inch or two, depending on the quantity of water that is expected to be formed; this must not be crammed but put rather lightly into the tube. The tube is now to be bent as represented in fig. 1, and its weight may be again taken, but this is not absolutely requisite, it is however well to do it. The tube is then to be covered with thin sheet copper, and placed between the forceps as represented in the same figure, with its open extremity inserted under a jar in the ordinary mercurial pneumatic trough, or it may be connected with a gasometer of Mr. Pepys's construction, which when ten or twenty grains of a substance are employed, and the quantity of either carbon or azote it contains is considerable, is convenient. Small mercurial graduated jars may be used, even if very large quantities of gas are obtained, as the process of decomposition may at any time be stopped almost instantaneously,* and the quantity contained in them being registered, they may be alternately filled with mercury and displaced by the gaseous products, as long as any comes over, reserving only the last portions for examination, of which a few cubic inches alone are requisite.

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* The balance I have been in the habit of using was made for me by Mr. Robinson, and is sensibly affected by $\frac{1}{400}$ of a grain when loaded with 1000 grains at each end.

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* The finer portion is taken from the oxid to allow more freedom of passage for the vapour through it, in some cases the rush of gas is so sudden, was it not for this precaution, it would be likely to burst the tube.

The lamps being trimmed with very short wicks are now to be lighted, lighting those first that are nearest the gasometer, and when the tube is red hot the remaining ones may be set fire to in succession, until the whole length of tube that is filled with the oxid is red hot. One set of lamps for a tube of the size I have mentioned above is generally sufficient, but should tubes be used of larger size, such as half an inch in diameter, both sets will then be required. In coating the tube with sheet copper care must be taken not to cover that part of it which contains the asbestos, otherwise the heat will be conducted by it to that portion of tube and prevent the condensation of the vapour of water, which is very essential; and in placing the tube between the forceps, it will be convenient to allow that part of it which contains the volatile matter to project beyond the forceps, the heat that is conducted by the copper coating is generally enough to volatilize most substances. In the analysis of substances containing much hydrogen, and especially when ten or twelve grains of them are taken, it will be found convenient to attach to the tube a small bulb to contain the water that is generated; this is represented by fig. 6. I believe I have stated the whole that is necessary as respects the management and use of this apparatus as far as regards the decomposition of volatile substances; in the next place, I shall speak of its application to the decomposition of fixed substances, which after what has been said will require but very few words.

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* I consider this as one of the advantages of this apparatus.

If the substance be a vegetable salt it must be freed from all extraneous moisture, this is best effected by suffering it to remain over an hygrometric substance *in vacuo* for some time.

Those who have not the convenience of an air-pump, may content themselves, by operating in this way, which although not quite so elegant, answers the purpose extremely well. A wide-mouthed phial provided with an accurately-ground stopper being procured, select another and much smaller phial that will easily go into it, and allow the stopper of the larger one to close accurately; it is as well to apply a little tallow to the stopper to ensure its more perfect fitting; strew on the bottom of the larger phial a quantity of chloride of calcium (dry muriate of lime), put into the smaller phial the substance in fine powder intended to be dried, and place this in the larger phial standing on the chloride; moisten a small piece of bibulous paper with alcohol, and put it into the larger phial, but not inside of the smaller one; when thus arranged set fire to the moistened paper, and when it has burned a second or two put the stopper in its place; a very good vacuum is by this means formed, and the process of dessication goes on rapidly. I have repeatedly used this method and found it succeed very well; I think equally so with that usually adopted by means of the air-pump; although by some it may be ridiculed in these days of elegance and refinement.

The substance in this state is to be mixed with a portion of the oxid recently ignited, but in this case suffered to cool then as quickly as possible introduced into the tube. As much of the oxid may be used as would occupy an extent of tube equal in proportion to that shown in fig. 5; a quantity of oxid is then to be put upon the mixture, and over this it is sometimes well to put a small quantity of copper-filings or scrapings; upon these the asbestos is to be used as above, and the operation of ignition is to be conducted in a somewhat different manner to that last-mentioned.

The lamps in this case are to be lighted at the extremity next the gasometer, and as soon as the gas ceases to be liberated, the next in succession may be employed, and so on to the end; but instead of suffering the whole of them to continue in flame, it is as well to extinguish a portion, and to suffer only about three or four to remain in operation at once, but taking care to ignite the whole extent of tube at the close of the process. The gaseous products being collected, and their bulk noticed, their analysis is to be conducted in the usual manner, taking care, however, in all instances to observe the precise temperature of the gases, that their bulk, as also the quantity of aqueous vapour they contain, may be estimated,* and either to equalize the internal and external surfaces of the mercury, or to calculate the volume of gas by the difference of mercurial levels.

Reference to the Drawing of Mr. J. T. Cooper's *Apparatus for Analysis.—Plate II.*

Fig. 1, *a a* and *b b*, two long spirit lamps each having ten burners and wicks, the burners of each lamp sloping towards those of the other, as seen in the end view, fig. 2; they are placed in a tin tray, *c c*, mounted on four feet; this tray is perforated in the middle the whole length of the lamps, and as wide as *e e*, fig. 2; the object in making the burners sloping is that they may clear the lamps and approach each other as near as requisite, and yet leave a clear current of air to the flames, and the tray is perforated and mounted on feet to admit this current.

d d, are springing wires placed at each end of the tray to receive the tube *f f*, which contains the substance to be analysed, and to hold it over or between the two rows of flames; by pressing the finger and thumb on the two shoulders, *g g*, fig. 2, the wires open to receive the tube, and close on letting go; and should the tube be shorter than the lamps, an additional support on a leaden foot, fig. 3, is placed through the opening *e e* of the tray to rise between the flames, and hold the end of the tube; the tubes are hermetically sealed at one end, and the materials then put in while the tube is straight; it is then bent at the other end to suit the mercurial trough.

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* For which very convenient formulæ will be found in the ninth edition of Dr. Henry's Elements of Chemistry.

The tubes are coated with copper foil, wrapped spirally round them; if each succeeding fold lie on half the other there will be a double coat of copper all the way; if it lie on two-thirds, there will be three layers of copper, and so on; by which the glass tube is supported from bending when hot, and becomes very uniformly heated. The spirals are continued beyond the end of the tube, to reach the support, and leave the end within the flames. The dotted lines at *h*, fig. 4, shew the end of the tube, short of the support; the foil is secured at the last coil by binding wire, as at *i*.

Fig. 5 shows the foil in act of being wrapped on, also the proportion of the space occupied by the materials; first, the mixture of oxide of copper with the material to be analysed, next pure oxide of copper, or copper filings, and, lastly, asbestos. When the quantity of water formed is considerable, the tube is either blown into a bulb, as at *k*, fig. 6, or melted on to one ready prepared as at *l*.

Fig. 7 is a long funnel, made by drawing out the end of a tube of a suitable thickness at *m*, till it is long and small enough through *n n* to reach to the bottom of the tube, and then cutting it off at *m*, by which liquids may be introduced to the bottom of the tube without wetting the sides.

As the wicks nearest the trough are to be lit first and the remainder in succession, as the former finish their action, there are upright supports of tin, *o o*, fixed on the lamps, one for each space between the burners, against which to rest a slip of tin *p p*, to prevent the lighted wicks from kindling those next, and it also enables the experimenter to blow out those that have done their duty. In fig. 2, the tin slip, *p p*, is shown by dotted lines, reaching from lamp to lamp: little flat caps are put on each burner when done with, to prevent the waste of spirit. Fig.

8 shows one of these caps, *q*, on its place; *r r*, fig. 1, a shelf fixed to the mercurial trough, to hold the lamps; *s s* the graduated jar. Tin pipes with corks, *w w*, as shown in fig. 2, are the apertures to pour the spirit into the lamps; their places only are marked at *w w*, fig. 1.

Nº IV.

HYDROMETER FOR SALINE SOLUTIONS.

The GOLD VULCAN MEDAL *was this Session presented to Mr.* J. T. COOPER, *of Paradise Street, Lambeth, for a* HYDROMETER FOR SALINE SOLUTIONS. *The following Communication has been received from Mr. C. on the Subject, and a Set of the Apparatus has been placed in the Society's Repository.*

THE inconvenience and inaccuracy attending the hydrometers that have hitherto been in use for determining the specific gravity of acids, acid and alkaline solutions, solutions of neutral salts, &c. has caused me to direct my attention to the construction of an instrument that should be free from those objections; accordingly, it is presumed the instrument now presented to the public through the medium of the Society's transactions will be found convenient in its application, and accurate in its results.

In the present communication I shall venture to give those instructions that will enable any one who is the least conversant with matters of this kind, to construct these instruments; and I do it the more especially as I am not acquainted with any work that treats of this subject in a way intelligible to ordinary understandings.

If the tube which forms the stem of the hydrometer be perfectly cylindrical (and choice should be made of such only as are so), the whole graduation from water to oil of vitriol may be effected by two solutions only, of intermediate specific gravity; it will be found convenient if these are of the specific gravity 1,3 and 1,6.

The internal bore of the tube should be of such a size as to admit of a paper scale being introduced, of the width of that shown in fig. 9, plate II, and the substance of the glass as thin as may be; the length of it may be about seven inches; upon this tube is to be blown, as in common, a glass bulb and stem, of the shape and about the proportional size, as is shown in fig. 8. It is also necessary to be provided with a considerable number of glass bulbs, with platina loops cemented into them, as is shown in the same plate; these must vary considerably in their weights, in order that one may be chosen from among them near the weight that is wanted. These things are all to be obtained of those persons who are in the habit of blowing glass for such purposes.

These things being prepared, the next step is, to proceed to graduate the hydrometer.

It is a well-known law in hydrostatics that when a solid body floats, partly immersed in a fluid, it displaces its own weight of that fluid; and it follows, as a necessary consequence, that the portion of the solid immersed is inversely as the density of the fluid in which it floats. Now, to apply this principle to the graduation of a hydrometer, say, as the specific gravity of any fluid is to the specific gravity of water, so is the bulk of the immersed portion of a hydrometer, when floating in water, to that of the immersed portion of the same hydrometer when floating in the fluid the specific gravity of which forms the first term. Now the specific gravity of water, and also the bulk of the immersed portion of a hydrometer floating in it, being both considered as unity, the rule given above may be conveniently expressed as follows:—divide unity by the specific gravity, and the quotient will be the bulk of that portion of the instrument that is immersed.

The following Table has been constructed on this principle, and from it the scale given in plate III, has been formed, which is applicable to the graduation of any hydrometer whatever within the range of specific gravities expressed by it:—

A Table of Volumes corresponding to Specific Gravities.

S. G.	Volume.	S. G.	Volume.	S. G.	Volume.	S. G.	Volume.
,7	1,4285	1,	1,	1,3	,7692	1,6	,6250
,71	1,4084	1,01	,9900	1,31	,7633	1,61	,6211
,72	1,3888	1,02	,9803	1,32	,7575	1,62	,6172
,73	1,3698	1,03	,9708	1,33	,7511	1,63	,6134
,74	1,3513	1,04	,9615	1,34	,7463	1,64	,6097
,75	1,3333	1,05	,9523	1,35	,7407	1,65	,6060
,76	1,3157	1,06	,9434	1,36	,7352	1,66	,6024
,77	1,2987	1,07	,9345	1,37	,7299	1,67	,5988
,78	1,2820	1,08	,9259	1,38	,7246	1,68	,5952
,79	1,2658	1,09	,9174	1,39	,7194	1,69	,5917
,8	1,2500	1,1	,9090	1,4	,7142	1,7	,5882
,81	1,2345	1,11	,9009	1,41	,7092	1,71	,5847
,82	1,2195	1,12	,8928	1,42	,7042	1,72	,5813
,83	1,2048	1,13	,8849	1,43	,6993	1,73	,5780
,84	1,1904	1,14	,8771	1,44	,6944	1,74	,5747
,85	1,1764	1,15	,8695	1,45	,6896	1,75	,5714
,86	1,1627	1,16	,8620	1,46	,6849	1,76	,5681
,87	1,1379	1,17	,8547	1,47	,6802	1,77	,5649
,88	1,1363	1,18	,8474	1,48	,6756	1,78	,5617
,89	1,1235	1,19	,8403	1,49	,6711	1,79	,5585
,9	1,1111	1,2	,8333	1,5	,6666	1,8	,5555
,91	1,0989	1,21	,8264	1,51	,6622	1,81	,5524
,92	1,0869	1,22	,8196	1,52	,6578	1,82	,5494
,93	1,0752	1,23	,8130	1,53	,6535	1,83	,5464
,94	1,0638	1,24	,8064	1,54	,6493	1,84	,5434
,95	1,0526	1,25	,8000	1,55	,6452	1,85	,5405
,96	1,0416	1,26	,7936	1,56	,6410	1,86	,5376
,97	1,0309	1,27	,7874	1,57	,6305	1,87	,5342
,98	1,0204	1,28	,7812	1,58	,6329	1,88	,5319
,99	1,0101	1,29	,7751	1,59	,6289	1,89	,5291

To apply this scale—suppose it has been ascertained that from the point to which the instrument sinks in distilled water of a given temperature, to the point to which it sinks in a fluid whose specific gravity is 1,3, and of the same temperature, measures five inches, or any other quantity; take this quantity in a pair of compasses, and having set one leg on the point marked 1, plate III, place the other on the vertical line drawn from the point marked 1, 3; then, by drawing a line between these two points, all the intermediate divisions will be found at the points where the verticals intersect this line. Next, take a heavier weight, and such as will sink the hydrometer in a fluid whose specific gravity is 1,3, nearly to the top of the scale; then transfer it into a solution whose specific gravity is 1,6; take off by the compasses the distance between those two points, and transfer it to the scale, as before. Lastly, take a heavier weight, that will sink the instrument, as before, in the fluid whose specific gravity is 1,6, to somewhere near the top of the scale; then plunge it into sulphuric acid whose specific gravity is 1,845, and mark this distance, and apply it to the scale, as before; thus all the intermediate divisions between water and oil of vitriol will have been obtained with accuracy to the second place of decimals, and these may now be transferred to the proper scale, as represented in plate II, fig. 9, ready for insertion into the tube of the hydrometer, which when done and fixed in its proper place the extremity of the tube may be sealed hermetically with the blow-pipe; but care must be taken to seal it by the impulse of the flame only, and not by allowing anything to touch it, otherwise the weight of the instrument might be changed, and its accuracy, consequently, be affected throughout its whole range.

I find it convenient to introduce into the tube while I am determining the distance between the points, a temporary scale, divided into minute arbitrary divisions, made of the same size and of the same paper as the one I intend for the real scale, by which I avoid any risk of error in measuring the divisions, and of ultimately effecting a change in the whole weight of the hydrometer.

It is almost needless to mention, that the same plan of construction may be extended to a hydrometer for fluids lighter than water; such an instrument may be advantageously employed for determining the specific gravity of ammoniacal solutions, of sulphuric æther, &c. and will be found to give results sufficiently near for commercial purposes, if temperature be correctly taken into the account; but for alcohol I cannot do better than recommend the use of Stokes's Hydrometer, as improved by Mr. Ainger.

The above method, as has been premised, depends upon the stem of the instrument being truly cylindrical; but should the stem be otherwise, a greater number of points must of consequence be taken, and, of course, a greater number of fluids will be required; not less than seventeen ought to be used under these circumstances; the interpolations may then be made as above.

N° V.

OXY-HYDROGEN BLOW-PIPE.

The GOLD ISIS MEDAL *of the Society was this Session presented to* GOLDSWORTHY GURNEY, *Esq. Surgeon, for his* OXY-HYDROGEN BLOW-PIPE, *which has been placed in the Society's Repository.*

THE investigations and discoveries of sir H. Davy, on the nature of flame, and the successful application of them in the construction of the miner's safe-lamp, demonstrated that the flame produced from the detonation of explosive mixtures of carburetted hydrogen and oxygen is not capable of passing through the small interstices of iron wire gauze. It was hence concluded that a similar barrier interposed between two portions of a mixture of oxygen and hydrogen in the proportions necessary to produce water, would prevent the inflammation of one portion from being communicated to the other, and thus would render safe the use of that most powerful instrument of combustion, the oxy-hydrogen blow-pipe. Accidents, however, occasionally occurred, notwithstanding the interposition of the wire gauze, and this circumstance induced Mr. Gurney to institute experiments, with the view of ascertaining the cause of these accidents, and, if possible, of preventing them. Accordingly, he first provided a jet, consisting of a cylinder of copper, three inches long, one inch in diameter, and perforated by a hole one-eightieth of an inch in diameter, in which the difference between the areas of the section of the solid metal and of the aperture, gave to the experiment nearly all the chance of success which it could derive from such means. Through this tube, however, the flame repeatedly passed, each time exploding the reservoir. He next reduced the size and increased the number of the apertures, by casting plaster of Paris round twenty lengths of the finest steel harpsichord wire, which were afterwards drawn out, and a brass cap fitted on, uniting all the gas passing through the apertures into one common jet. This succeeded no better, nor was any security obtained by increasing the length of the tube from three to six inches and casting lead round the wires instead of plaster.

After trying, without success, tubes of all descriptions, and many modifications of wire gauze, Mr. Gurney observed, that when the mixed gas was issuing from the reservoir in a state of great compression, it would not burn at the jet, and he further noticed that the explosions in the former experiments had all taken place when the pressure in the reservoir had become considerably lessened. It appeared, therefore, that though the gas under diminished pressure will pass in a state of ignition through very small tubes, yet that under stronger pressure it will not ignite when actually passing through the flame of a taper, and, of consequence, that its combustion is in a greater degree affected by the mechanical force with which it is impelled, than by the size of the current, or of the tube through which it passes. It immediately occurred that this principle might be applied in giving safety to the instrument: a new series of experiments was accordingly instituted, with an apparatus in which the amount of pressure on the gas could be accurately ascertained and regulated. By various modifications of the impelling power, it was proved that the gas, under moderate pressure, will return, in a state of ignition, through the smallest possible tubes, of whatever material, through the pores of cane, and even through those of Honduras mahogany; while, by increasing the pressure, the gas may be burned with safety at the end of a tube, one-eighth of an inch in diameter, and by still greater pressure is extinguished altogether.

The principle being thus established, it seemed necessary, merely to give due rapidity to the current of gas, to ensure safety to the reservoir; but that every slight diminution of its force, to which from various circumstances it might be exposed, would occasion a retrograde movement of the flame, and consequently cause the reservoir, or gasometer, to explode. After many fruitless attempts, the idea suggested itself to Mr. Gurney that he might make use of this retrograde movement of the flame to effect its own extinction, by allowing a partial explosion in a small chamber constructed for that purpose, and interposing between the chamber and the gasometer such a combination of tubes, or wire gauze, as would, agreeably to the principles already deduced, prevent the passage of inflamed gas into the reservoir, by taking advantage of the increased rapidity which it would acquire from the explosion in the chamber. On trial this contrivance appeared perfectly to accomplish its object; for the instant that the pressure was reduced, the flame passed back through the jet, exploded in the chamber, and was there extinguished: continuing the experiments, however, it was discovered, that when the jets exceeded a certain size they allowed the free escape outwards of the expanded gas and aqueous vapour, and thus greatly diminished the rapidity with which the remainder of the gas contained in the chamber was propelled through the interposed wire gauze; the consequence was, that the flame was communicated to the gasometer. To obviate this, however, merely required an increase of the mechanical force of the explosion, by enlarging the size of the chamber; and it was ascertained that, to ensure safety, the capacity of the chamber must be proportioned to the size of the jet and of the meshes of wire gauze. With these provisions, the apparatus has, by innumerable trials, been proved to be effectual; and even when acted on precisely under the same circumstances as those which allowed the explosion to pass even through the pores of dense wood, the flame has never receded beyond the safety chamber.

Thus assured of having obtained his object, Mr. Gurney would have remained satisfied; but considering how difficult it is to remove the general impression of hazard attending the use of the oxy-hydrogen blow-pipe, he has introduced into the construction of the instrument the additional precaution of a cistern of water between the jet and the bladder containing the gas.

The following references to the engravings, plates IV and V, will supply a complete description of the form and construction of the instrument.

a is the reservoir or gasometer, consisting of a small bladder, supported on a table *b*, and surmounted by a thin board *c*, which is strengthened by the ribs *d d*, and attached by slight threads to the four wires *e e e e* which pass freely through holes in the table *b* and are fastened at their lower extremities to the board *f f*, called the pressure board. This board is perforated in the centre, and the aperture is occupied by the upright rod *g g*, which guides it in its motion up and down. To this board the hand of the operator is applied for the purpose of compressing the gasometer and of causing the gas to escape at the jet *h*, the nature of the communication of which with the gasometer is explained in the section fig. 1, plate V, in which *a* is the lower part of the gasometer, attached to a brass neck in the cap over the cylindrical chamber *k*, of which a horizontal section is shown on a larger scale at fig. 2. This chamber, together with the tubes on each side of it, as far as the letters *z z*, is concealed in the table *b*, which has a slight concavity formed in its centre, to offer a more convenient resisting surface to the pressure of the bladder. The gas is driven in the direction marked by the arrows, till it passes into the curved pipe *l*, immersed in the cylindrical water-vessel *m*, through which it rises in bubbles. The water-vessel is closed by a cork *n*, so fitted, that in the event of an explosion taking place there, the cork would be thrown out and no farther consequences ensue. There is another curved pipe *o o*, running up into the cork *n*, which, for the present, it may be supposed does not exist, and that the gas finds its way immediately from the surface of the water to the chamber *p*; it then passes through about sixty layers of wire gauze *q* (having eighty meshes to the inch), next into the chamber *r*, thence through about twenty other layers of similar gauze *s*, into the chamber *t*, and lastly escapes at the jet *h*, where it is inflamed.

Having described the progress of the gas from the gasometer to the jet, it will best explain the nature of the contrivance for preventing any mischief arising from explosion, to trace the effect of an explosion backwards to the gasometer. As soon as the pressure on this last is sufficiently reduced, the flame at the jet recedes and inflames the gas in the chamber *t*, the mechanical force of which explosion is supposed adequate to prevent the passage of the flame through the wire gauze *s*, according to the principles before alluded to. Should it fail to do this, a second explosion takes place in the chamber *r*, the force of which acts on the second series of wire gauze layers *q*, and once more tends to extinguish the flame; which if it does not accomplish, the explosion is communicated to the gas over the water, and the cork is thrown out as already described. The top *c* surmounting the bladder, and the ribs *d d* which strengthen it are made of wood so thin, that in the event of their being thrown up by an explosion of the gasometer, the resistance of the air prevents them from rising to any considerable height and they fall to the ground perfectly harmless.

The gasometer can be replenished at pleasure by means of the transferring bladder *u*, plate IV, which communicates with the cylindrical chamber *k*, as shown in fig. 1, plate V. That communication is shut off by the spiral spring acting against the valve *v*, fig. 2, as soon as the pressure is withdrawn. The stop cocks *w w* cut off the connexion between the different parts of the apparatus when required. The purpose of the curved pipe *o o* is the following: it was found that the water in the vessel *n* was sometimes so violently agitated by the rapid passage of the gas through it, that it filled the safety chambers *r* and *t*,* and to prevent this, the curved pipe *o o* was added, and a deep cavity was made in the cork somewhat larger than the pipe. The lower surface of the cork is covered with a piece of leather, which embraces the pipe closely, and prevents both the water and gas from passing immediately into the cavity in the cork: that the gas however may find its way into the cavity, the cork does not descend close to the shoulders of the water-vessel, and two channels (see *x x*, fig. 3) are formed in its lower surface previous to covering it with leather. The lower edges of the cork are rounded or chamfered off, which gives the gas easy access to the channels, and thence to the cavity and to the pipe. In fig. 1, *y* is a screw which regulates the height of the water in the vessel.

Fig. 4 represents a jet, having at its angle a swivel joint, by which the flame may be directed either upwards, downwards, or laterally, at any angle. This jet is screwed immediately into the water-cistern, and the safety chambers are placed at the other end, as near as possible to the issue pipe. This construction is necessary in order to avoid explosion;

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* Another mode of preventing the influx of water into the safety chamber has been proposed; namely, to fill the cistern with oil instead of water; this, however, is highly objectionable, on account both of the combustibility of the oil, and of its comparatively viscid consistence, in consequence of which, when a full stream of gas is passing through, the bubbles become almost continuous, and an explosion in the upper part of the cistern is very liable to be communicated through the oil to the bladder or reservoir.

for if the safety chambers were placed at that end which is adjacent to the water-cistern, nearly the whole cavity of the jet would be in front of the first safety chamber, the consequence of which would be, when an explosion took place in this chamber, that the expanded vapour would pass so freely forwards as to be incapable of moving in the opposite direction with the rapidity necessary to extinguish the flame.

The dark parts shown in the engraving between the abutting shoulders at all the screwed joints, represent collars of leather. A variety of jets differing both in length and diameter are made and applied as the nature of the effect to be produced requires; but in all these jets the safety chambers must be placed as near as possible to the orifice for the issue of the gas. Fig. 4 represents one with a swivel joint, by which the flame can be directed perpendicularly upwards or downwards, laterally, or at any angle.

Fig. 5 describes a simple apparatus for collecting the products evolved during the decomposition of any substance by the blow-pipe. A is a slab of chalk, having a cavity in its upper surface, to receive the material to be acted on; the jet which is so formed as to throw the flame obliquely downwards, is introduced through the side of the slab of chalk, and is, together with the safety chambers, attached by a flexible tube B B to the water-vessel of the blow-pipe. The slab of chalk is ground on its upper surface, to fit a ground glass receiver, with a brass cap, stop-cock, and bladder, to collect the products of the decomposition.

N° VI.

TEST FOR ACIDS, ALKALIES, AND COMPOUND SALTS.

The THANKS *of the Society were this Session given to Mr.* THOMAS GRIFFITHS, *of Church-street, Kensington, for his Communication* ON THE USE OF THE COLOURING MATTER OF RED CABBAGE AS A TEST FOR ACIDS, ALKALIES, AND COMPOUND SALTS. *A Specimen of the Test-paper prepared by him is placed in the Repository of the Society.*

SIR; 9, Church-street, Kensington.

I REQUEST you will lay before the Society of Arts, &c. the inclosed specimen of test-paper, made from the infusion of red cabbage, which paper is a test of the presence both of acids and alkalies; the former changing its blue colour red, the latter changing it green.

The application of this paper to the purpose of the experimental chemist I believe will be found to possess a claim to originality. It is thus prepared:—Take one pound of the minced leaves of the red cabbage, and boil the same with a pint of distilled water, till all the blue colour is extracted. The liquor is then to be strained through a cloth or sieve; and the clear infusion, which is of a fine blue colour, is to be evaporated to half its bulk, and poured into a shallow dish: the paper may then be dipped into it, and hung on lines to dry.

A sheet of the filtering paper, which is the paper used, absorbs two fluid ounces of the infusion.

Metallic and other salts which, although they be neutral, give indications of alkali with turmeric paper, do not affect this paper as alkalies, but give indications of neutral or acid salts, as may be the case.

The paper is reddened by the following acids:—Acetic, arsenic, boracic, camphoric, carbonic, citric, malic, muriatic, nitric, oxalic, phosphoric, prussic, pyroligneous, sulphuric, sulphurous, tartaric, and all the acids that I have tried.

It is turned green by the following alkaline substances:—Potash, soda, lime, baryta, strontia, magnesia, ammonia, carb. ammonia, carb. potash, carb. soda, borax.

The following substances give alkaline indications with turmeric paper, not being so:—Permuriate iron, protomuriate iron, pernitrate of iron, protonitrate iron, protosulphate iron, persulphate iron, sulphate zinc, muriate of tin, muriate of zinc, boracic acid.

Corrosive sublimate reddens this paper as also that from litmus.

Acetate of lead turns this paper green as an alkali does, but there is no test paper with which it does not give indications of alkali.

In alkalimetry *two* test papers are employed, litmus and turmeric, and two drops have to be taken repeatedly from the solution in order to try if it is acid or alkaline, and by taking away so many drops the result of the process is rendered fallacious.

With my test-paper one drop of the solution only is required, as it is a test both for acid and alkali. In many other processes of analysis a test for acid and alkali at one operation may probably be found advantageous.

THOMAS GRIFFITHS.

PAPERS

IN

POLITE ARTS.

N° I.

METHOD OF PRESERVING OIL-COLOURS.

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The SILVER MEDAL AND TEN GUINEAS *were this Session presented to Mr.* JAMES HARRIS *of Plymouth, for his* METHOD OF PRESERVING OIL COLOURS, *for the Use of Artists, in Syringes, instead of the Bladders in which they are commonly kept. One of the Syringes is placed in the Repository of the Society.*

THE oil colours employed by artists are generally sold in bladders, which, while entire, preserve most of them in a state fit for use. The colour is got out as it is wanted by puncturing the bladder, and then pressing it till as much has exuded as the artist has present occasion for. But after being punctured the air is very apt to get into the bladder, and by combining with the paint to thicken it, and render it in a greater or less degree unfit for use. Some colours are kept under water; but this practice is not applicable to those in the composition of which the lakes and Prussian blue are employed as ingredients, for these, both in bladders and under water, are very liable to become ropy, in which state they are no longer serviceable.

The idea suggested itself to Mr. Harris of preserving oil-colours in syringes of tin, or of brass well tinned internally, by which he expected to attain the advantages of perfect exclusion from the air and from the light, whether the quantity in the syringe was much or little, also of greater cleanliness and of a more perfect separation of one colour from another than usually takes place when the bladders containing them get torn by use. He accordingly got a few sets made, and put them into the hands of artists, who, after a competent trial, expressed their satisfaction with them, finding them to possess the expected advantages, and also that the lakes and other tender colours might be kept in them without deterioration.

Three of these certificates are subjoined, together with a description of the instrument as represented in Plate VI.

CERTIFICATES.

11, New Cavendish-street,
Jan. 29th, 1823.

SIR;

I HAVE great pleasure in testifying, after a trial of more than seven months, my entire approval of Mr. Harris's invention for the preservation of oil-colours. I have found it completely effect the desired purpose of keeping the colour in a fit state for use; it is a much more cleanly mode, and, being subject to no waste, more economical, than any other I am acquainted with.

In justice to the inventor of this useful article, I must add, that I write this not at his desire, but at the suggestion of Mr. Solly.

I am, Sir,
&c. &c. &c.
W. Collins.

To A. Aikin, Esq.
Secretary, &c. &c.

31, Gerrard-street,
March 20th, 1822.

SIR;

Having for some time used your syringes for oil-colours, I have great pleasure in assuring you they have my entire approval, and I feel confident they will be found to possess great advantages over the skins in which oil-colours have been usually kept.

I am, Sir,
&c. &c. &c.
John King, *Artist.*

Mr. James Harris.

Russell-square, March 21st, 1822.

Mr. Harris's invention for the longer preservation of prepared oil-colours, appears to me to be equally ingenious and useful, and at my desire he has ordered a set of cases to be made for my immediate use.

Thomas Lawrence, *P. R. A.*

Reference to the Engraving.—Plate VI.

Fig. 9 represents the syringe in use ; *g g*, the cylinder, on the top of which is screwed the cap *h ; i i*, a screw which serves instead of a piston rod ; *k*, a handle with a square hole, fitting easy on the squared top of the screw, in order to turn it ; *l l*, the piston, shown by dotted lines ; *m*, the jet through which the paint oozes, whenever the piston is advanced, by turning the screw *i ; n*, a screw-nut to secure the jet when out of use.

Fig. 10, a bird's-eye view of the piston, showing the brass cross-plate *o*, with a hollow to receive the end of the screw.

Fig 11 is a section of the piston, which is made of cork, covered with soft leather ; a second leather, *p p*, is wrapped round it, and sewed at top and bottom to the first ; a plate of metal, *q*, well tinned, is put at the bottom, and secured by the two screws *r r*, going through the cross-plate *o* and the cork, which latter, by this means, is kept from elongating, and thereby its lateral pressure is preserved.

When the syringe is to be charged with paint, the screw-nut *n*, and the screw cap *h*, are taken off, and the piston is drawn out by the hooks, fig. 12, which catch in the eye-headed screws *r r ;* it is then filled with paint to the top, and the piston is laid on, and gently pressed ; as much paint will then ooze out of the jet as to allow the piston to go in level with the top ; the cap *h* is then screwed on (the screw *i* being drawn up to the last thread), and it is ready for use. The inside is tinned, to prevent the oil acting on the brass.

N° II.

PAINTER'S REST.

The SILVER ISIS MEDAL *was this Session presented to* W. BROCKEDON, *Esq.*, 11, *Caroline Street, Bedford Square, for a* REST FOR THE USE OF PAINTERS. *The following Communication has been received from Mr. B. on the Subject, and a Model of the Machine has been placed in the Society's Repository.*

11, Caroline-street, Bedford-square,
May 3, 1823.

SIR;

THE painters' rest, which accompanies this letter, needs little description to explain its use; it is intended as a substitute for the common maul-stick, the inconvenience of which has been often felt by painters, sometimes from its increasing the pressure, to the fatigue of the hand, which also supports the pallet, often, in spite of the padding with which the end is armed, doing injury to the picture, if not quite dry. These disadvantages are obviated by the machine which I have the honour of submitting to the consideration of the Society. It consists of a frame, with feet of unequal length, the longest being always placed under the easel, that the pressure of the hand may not turn it over towards the picture. In the outer frame a sliding frame is made to raise, and be fixed by a ratchet; if the height required exceed the extent of the ratchet, the swing frame will again extend the elevation, owing to its pivots being placed out of the centre.

The machine is capable of any adjustment, from a low sitting elevation to a very high standing one, and is firm enough to steady the hand perfectly.

I am, Sir,
&c. &c. &c.
WM. BROCKEDON.

A. Aikin, Esq.
Secretary, &c. &c.

The following testimonials in favour of Mr. Brockedon's invention, have been received from the artists whose names are subjoined:—

CERTIFICATES.

Russell-square,
May 16, 1823.

HAVING attentively examined the painter's rest, invented by Mr. Brockedon, I have no doubt of its affording great assistance in painting works which demand delicacy of execution, and minute accuracy. It may indeed be of considerable use to all artists who paint sitting, and would be needless or inconvenient, only in the execution of pictures of large dimensions, for which a standing posture and frequent retiring from the work, are necessary.

THOMAS LAWRENCE, *P. R. A.*

Argyll-place,
May 16, 1823.

SIR;

I THINK your invention of the painters' rest for the hand must be of great use to all painters of small pictures, and of much value to them; but in large compositions the stick in the hand will be required, and to painters of great works this invention can only become necessary in the last touches in finishing the work.

I am, Sir,
&c. &c &c.
JAMES NORTHCOTE.

8, Buckingham-place,
May 13, 1823.

SIR;

THE apparatus you have invented as a substitute for the maul stick, appears to me so completely calculated to prevent the many difficulties and dangers resulting from the use of that most inconvenient of all the tools we artists work with, that I, as one, offer you my best thanks for a discovery that I think must ensure the gratitude of the whole fraternity, as soon as it is known to them.

I should like to have one as soon as possible.

I am, Sir,
&c. &c. &c.
C. R. LESLIE.

30, Allsops-buildings, New-road,
May 12, 1823.

SIR;

I HAVE examined your invention of the painter's rest and find that it answers every purpose of the maul-stick, with the advantage of not touching the picture; it would answer in the execution of any of my works, and meets with my entire approbation.

I am, Sir,
&c. &c. &c.
JOHN MARTIN.

Marlborough-street,
SIR; May 13.

After examining your contrivance for a painter's rest, I am satisfied that it possesses many advantages over the common maul-stick, providing against many of the accidents incident to the use of the latter, and that it will be found a valuable acquisition, particularly in works of minute execution.

I am, Sir,
&c. &c. &c.
G. Stuart Newton.

Reference to the Drawing of Mr. Brockedon's *Painter's Rest.—Plate VII.*

Fig. 4, a perspective view of the rest; *p p*, two standards framed together near the foot-board by a cross bar, and by the bar *z* at top; *q*, a rack cut in the right-hand one; *r*, the click catching in it; *s s*, two other standards framed together only by the bars *t* and *v*, having rabbates along their outsides, fitting into grooves in the inside of the standards *p p*, which serve as guides to them when sliding up and down. The frame *s s* is supported at any required height by the click *r*; *u u*, a long frame, filling the space between the standards *s s*; it is fixed to these latter by the thumb-screws *w w*. The upper part of this frame forms the rest for the arm; and in order to prevent it from turning on the screws *w w*, a pin or bolt *x* pushes in to fix it: this pin is shown in fig. 5; it has a loop-hole, through which a smaller pin passes, to keep it to its place: by withdrawing the little bolt *x*, the frame *u u* may be turned quite round on the screws *w w*, and then secured by them and by the bolt, as shown by dotted lines, to give an additional elevation, the same rack *q*, giving the intermediate height between this position and the former.

Fig. 6 shows a bird's-eye view of one foot *y y*, and standards *p* and *s*, and part of the frame *u*. The painter gives additional steadiness to the rest, by putting one foot on the footboard *y y*, in front. The whole rest inclines from top to bottom about as much as an easel in use generally does, and the long feet go under the canvas to let it approach near enough.

Nº III.

ENGRAVING ON STEEL PLATE.

The LARGE GOLD MEDAL *of the Society was this Session presented to Mr.* C. WARREN, *for his* IMPROVEMENTS IN THE ART OF ENGRAVING ON STEEL.

THE death of Mr. Warren, in the interval between the adjudication of the medal and the day of annual distribution of the rewards, has prevented the Society from receiving a written communication on this interesting subject from the inventor himself. The following statement, therefore, is taken from the report of the committee to the Society, and from details communicated by Mr. Warren's personal friends, especially by Mr. Joseph Phelps, who was pupil to Mr. Warren during the whole progress of his experiments and discoveries.

Some of the earliest specimens of engraving on steel were produced by Albert Durer. There are four plates etched by this artist, impressions of which exist in the British Museum, which, in all books of art, are recorded as having been executed in steel; of these, one has the date 1510 inscribed on it. Since that time attempts have been made occasionally to employ steel instead of copper, as a material to engrave upon, but apparently with little success, on account, principally, of the great hardness of the material, which in a short time blunted and destroyed the tools which were made use of.

Steel exists in two states, the elastic and the brittle, the former being considerably softer than the latter; of the elastic steel, a saw-blade may be considered as an example, and, in fact, pieces of saw-blade were the material upon which nearly all the first attempts have been made, of late years, to revive a practice which, if successful, offered so many advantages to the artist and to the public. Mr. Raimbach, a few years ago, executed an engraving on a block, or thick plate of steel, but met with so many difficulties in the execution, that his experiment remained insulated, and produced no sensible effect on the art of engraving.

Mr. Warren, in his early youth, was much employed in engraving on metals for the use of calico printers and gunsmiths, and the experience thus acquired induced him afterwards to turn his mind to the subject, with a view of applying it to fine art. It was suggested to him by Mr. Gill, one of the chairmen of the Committee of Mechanics, that the method employed by the artists of Birmingham, in the manufacture of ornamented snuffers, and other articles of cast steel, is, to subject the steel, after having been rolled into sheets, to the process of decarbonization, by means of which it is converted to a very pure soft iron; being then made into the required instrument, or other article, the ornamental work is engraved, or impressed, on the soft metallic surface, after which, by cementation with the proper materials, it is again converted superficially to steel, and thus rendered capable of acquiring the highest degree of polish.

In the attempt, however, to apply this process to plates for the engraver's use, two opposite difficulties occurred. A plate of steel, of the same thickness as that of common copper-plate, when thoroughly decarbonized and thus reduced to the state of very soft iron, yields readily to the graver and other tools, and, especially, is susceptible of the process of *knocking up*; this consists in scraping out the error, and afterwards striking the under side of the plate with a punch and hammer, in order to raise the cavity to the general level, and thus allow the artist to take the error out without occasioning any unevenness of the engraved surface: it was found, however, that plates of the thinness requisite for this operation and of the usual superficial dimensions, were very liable to warp in the last, or re-carbonizing process, and were thus rendered incapable of giving perfect impressions. If, in order to avoid this disadvantage, blocks, *i. e.* plates of three or four times the ordinary thickness, were made use of, the warping, indeed, was prevented, but at the same time the process of knocking up became impracticable, and it was necessary, in order to remove an error, or defective part, to grind out the surface, or to drill a hole from the under surface almost through the plate, and then, by forcing in a screw, to raise that part of the face which was immediately above it. This latter process, however, was so tedious and difficult as exceedingly to detract from the advantage of substituting steel for copper.

In this state of things it became a very interesting object of inquiry to ascertain how many impressions may be taken from a plate of soft or decarbonized steel; and it was found that such a plate, prepared according to Mr. Warren's process, is capable of affording several thousand copies without undergoing any sensible wear. In proof of this, impressions were laid before the committee by Mr. Warren, from two plates of decarbonized steel executed by him, the one for an edition of Mackenzie's works published by Cadell, the other for an edition of Beattie and Collins published by Rivington. These exhibit, both in the landscape and in the figures, the most elaborate and delicate work: five thousand impressions have been taken from one and four thousand from the other, and yet between one of the first and one of the last impressions it was impossible to detect any perceptible difference.

If Mr. Warren had carried on his experiments alone, working by himself till he had brought his plan to perfection, it is probable that, at the period of his death, the evidence of the great importance of his discovery would by no means have been so complete as it actually was, and the result of his exertions might have been lost, to the great detriment of the profession, and of the fair fame of this eminent artist: but selfishness and secrecy in any thing which related to the improvement of the art to which he was attached formed no part of his character; and all his discoveries, both those relating to the preparations of the plates, as well as those which have reference to the engraving upon them, were unreservedly and gratuitously communicated. The consequence of this liberality was, that besides the plates of Mr. Warren's own engraving produced before the committee, impressions were shown of portraits engraved on decarbonized steel, for the

Evangelical Magazine, demonstrating that, after 25,000 copies have been taken, the plates still remain in a good state, and are not yet in want of repair. Mr. Mar stated, that having made an engraving on one of Mr. Warren's plates, he did not take his own proofs till after the 8,000th impression; and, in another instance, the engraving being a portrait, Mr. La Hie, the printer, certified that the artist's own proofs were not taken off till after the 20,000th impression.

Mr. Warren's original process for decarbonizing the steel plates consisted in procuring a box, or case of iron, and covering the bottom of it with a mixture of iron turnings and pounded oyster shells; on this a steel plate is laid, another bed of the mixture is then added, and so on alternately, till the box is full, taking care that a bed of the composition shall form the upper as well as the lower layer. The box so charged, is then to be placed in a furnace, and to be kept for several hours at the highest heat which it will bear, without melting, after which, being allowed to cool gradually, the plates are found to be reduced, for the most part, to the state of soft decarbonized steel.

Mr. Hughes, a copper-plate maker, having been instructed by Mr. Warren in his process, and finding that the steel did not always turn out sufficiently and uniformly soft (particularly for the purpose of engravers in mezzo-tinto) imagined that those occasional defects were owing to a deficiency of heat in the cementing process; accordingly, he substituted a case or oven of refractory clay, for the cast iron one, and then, applying a considerably higher heat than the cast iron box would have endured without melting, was enabled to obtain plates so soft that they may be bent over the knee. Each plate requires two or more cementations; and, as the first cementation warps them more or less, Mr. Warren was in the habit of rectifying them by means of a hammer. Mr. Hughes finds that the places struck by the hammer are apt to be less softened by the second cementation than the other parts, and, therefore, that plates so treated will often turn out unequal in hardness. His own practice is to use a mallet, and as little force as possible in detaching the cement from the surface and in rectifying the plate.

The plate being cleaned and polished (but not too highly), is ready for the engraver. When it comes into his hands, the first operation is, to lay the etching ground, in doing which the plate must be rather less heated than is usual with copper, otherwise the ground, as it cools, contracts, presenting a honey-combed surface and leaving parts of the plate uncovered. The same defect is apt to occur if the plate is too highly polished. The ground should be laid rather thicker than on copper.

Various menstruums were made trial of by Mr. Warren for biting in with. Nitric acid, considerably more diluted than for copper, was made use of with, upon the whole, good success. Nitrate of mercury was found to blunt or round the edges of the lines; acetic acid, with a small portion of nitrate of copper, produced the same effect; sulphate of copper bit light tints very beautifully, but its further action rendered the lines rough. The best menstruum, however, is half an ounce of crystallized nitrate of copper, dissolved in a pint and a half of distilled water, and a few drops of nitric acid added to the solution. This will be found to bite both deeper and clearer than dilute nitric acid.

It will be advisable for the artist, when first etching on steel plate, to keep a register of the time which he finds necessary for the menstruum to act before the parts have attained their due degrees of strength, and this will serve as a guide to him in his subsequent operations. Mr. Warren generally found about two minutes sufficient for an outline, unless it was required to be very strong; the middle tint was produced in about ten minutes, and the darkest shadows in forty minutes. The menstruum should not be more than one-sixth of an inch deep on the plate, otherwise it will be difficult to see the work, and it becomes exhausted in about ten minutes, and then requires to be replaced. While the menstruum is acting, the work must be constantly swept with a camel-hair brush, in order to remove the precipitated copper, which, if allowed to remain in the lines, renders their edges rugged and destroys their beauty: especial care must be taken to clear the ends of the lines, as these are most liable to bite foul. In stopping out, the ground (Brunswick black) must be laid on very thin and even, and, instead of terminating abruptly, must be smoothed off very gradually; for the smallest ridge or prominence will retain the copper, and then the ground will infallibly be penetrated, and the biting will become foul. By attending to these directions, an etching may be obtained on decarbonized steel as deep and quite as sharp as it can be on copper.

Concerning the great superiority of steel-plate over copper-plate for all works that require a considerable number of impressions to be taken, there can exist no doubt: for though the use of the graver and of the other tools requires more time on steel than on copper, and though the process of re-biting has not yet been carried to the degree of perfection in the former that it has been in the latter, yet the texture of steel is such as to admit of more delicate work than copper; and the finest and most elaborate exertions of the art, which on copper would soon wear so as to reduce them to an indistinct smeary tint, appear to undergo scarcely any deterioration on steel;

even the marks of the burnisher are still distinguishable after several thousand impressions.

Both the public and the artist are eminently benefitted by this discovery; the public, by having a multitude of impressions as good as copper-plate proofs, and the artist in greatly extending the range of his reputation by the permanence thus given to the finest and most characteristic touches of his hand.

N° IV.

TAKING CASTS OF LEAVES AND FOLIAGE.

The SILVER ISIS MEDAL *was this Session presented to Mr.* W. DEEBLE, *of Seymour Place, Islington, for his* METHOD OF TAKING CASTS OF LEAVES AND FOLIAGE, *Specimens of which have been placed in the Society's Repository.*

SIR; 1, Seymour-place, Islington.

I HAVE ventured to offer to the notice of the Society of Arts, &c. a specimen selected from casts of leaves and other parts of plants, obtained by a process which, though very simple, is, for any thing I know to the contrary, new.

The object I proposed in making casts similar to the one now submitted, was to supply myself with fac-similes of the form and texture of those plants, which, as an engraver, I might have to introduce in the foreground of landscapes. It is well known, that those who have attained eminence in landscape engraving, have devoted a large portion of time to actual study in the fields. I need not allude to the difficulties which deny this practice to a man engaged in a profession demanding his own almost unassisted exertions, especially in a metropolis; nor mention how the inaptness of season or situation will prevent the obtaining of such plants as may be immediately wanted. These circumstances suggested to me the advantage, and a trial proved the practicability, of procuring, at an easy expense either of labour or money, accurate casts of the most common and conspicuous plants; after a few experiments, I perfected a process which I will describe, that succeeded to an extent of which the Society may form their own opinion from the specimen produced.

If the purpose I have named were the only one to which casts of this nature were applicable, or if I thought that my success was the limit of their perfection, I would not have troubled the Society with their consideration; but it has been imagined that practice in the operation of making the moulds, would lead to a degree of improvement of which my attempt gives a very inadequate idea; and which would render the casts useful for completing botanical collections, or illustrating botanical distinctions; and farther, that the exhibition of the varied forms and convolutions of flowers and leaves, in such a material as plaster of Paris, would suggest adaptations and combinations which might be made available to the decorative purposes of architecture; and prevent that perpetual recurrence to examples of antique ornament that stigmatizes the architectural talent of modern Europe.

I am not aware if these are objects that would be worthy of the promotion and patronage of the Society, supposing the probability of it even to be as great as I am flattered it is by the friends who have advised this communication. For myself, I have merely to say I shall be happy to exhibit the means to the Society, and more so, if they can discover in them any prospect of permanent good.

I am, Sir,
&c. &c. &c.
Wm. Deeble.

The following are the particulars of Mr. Deeble's process: The leaf, as soon as convenient after being gathered, is to be laid on fine-grained moist sand in a perfectly natural position, having that surface uppermost which is to form the cast, and being banked up by sand in order that it may be perfectly supported. It is then, by means of a broad camel-hair brush, to be covered over with a thin coating of wax and Burgundy pitch, rendered fluid by heat. The leaf being now removed from the sand and dipped in cold water, the wax becomes hard, and at the same time sufficiently tough to allow the leaf to be ripped off without altering its form. This being done, the wax mould is placed on moist sand and banked up as the leaf itself was; it is then covered with plaster of Paris made thin, care being taken that the plaster is accurately forced into all the interstices of the mould by means of a camel-hair brush. As soon as the plaster has set, the warmth thus produced softens the wax, which in consequence of the moisture of the plaster is prevented from adhering thereto, and with a little dexterity it may be rolled up, parting completely from the cast, without injuring it in the smallest degree.

Casts thus obtained are very perfect, have a high relief, and are excellent models either for the draughtsman or for the moulder of architectural ornaments.

PAPERS

IN

MANUFACTURES.

N° I.

FINE PLAT.

◆

The LARGE SILVER MEDAL *was this Session given to Mr.* W. COBBETT, *of Kensington, for* THE APPLICATION OF NATIVE ENGLISH GRASSES AS THE MATERIAL OF FINE PLAT. *The following Communication on the selection and preparation of the Grasses, has been received from the Candidate, and Specimens of them in their unprepared, and prepared states, and manufactured into Plat, are placed in the Society's Repository.*

Kensington,
April 14, 1823.

SIR;

1. AGREEABLY to your request, I now communicate to you a statement of those particulars which you wished to

possess, relative to the specimens of straw and of plat which I have, at different times, sent to you for the inspection of the Society.

2. That my statement may not come too abruptly upon those Members of the Society who have not had an opportunity of witnessing the progress of this interesting inquiry, I will take a short review of the circumstances which led to the making of my experiments.

3. In the month of June, 1821, a gentleman, a member of the Society, informed me, by letter, that a Miss Woodhouse, a farmer's daughter of Weathersfield, in Connecticut, had communicated to the Society a straw-bonnet of very fine materials and manufacture; that this bonnet (according to her account) was made from the straw of a sort of grass called *poa pratensis*; that it was unknown whether the same grass would grow in England; that it was desirable to ascertain whether this grass would grow in England; that, at all events, it was desirable to get from America some of the seed of this grass; and, that, for this purpose, my informant, knowing that I had a son in America, addressed himself to me, it being his opinion that if materials similar to those used by Miss Woodhouse could, by any means, be grown in England, the benefit to the nation must be considerable.

4. In consequence of this application I wrote to my son James (then at New York), directing him to do what he was able in order to cause success to the undertaking. On the receipt of my letter, in July, he went from New York to Weathersfield (about a hundred and twenty miles); saw Miss Woodhouse; made the necessary inquiry; obtained a specimen of the grass and also of the plat, which other persons at Weathersfield, as well as Miss Woodhouse, were in the habit of making; and, having acquired the necessary in-

formation as to cutting the grass and bleaching the straw, he transmitted to me an account of the matter, which account, together with his specimens of grass and plat, I received in the month of September.

5. I was now, when I came to see the specimen of grass, convinced that Miss Woodhouse's materials could be grown in England, a conviction, which, if it had not been complete at once, would have been made complete immediately afterwards by the sight of a bunch of bonnet-straw imported from Leghorn, which straw was shown to me by the importer, and which I found to be that of two or three sorts of our common grass, and of oats, wheat, and rye.

6. That the grass, or plants, could be grown in England, was therefore now certain, and, indeed, that they were in point of commonness, next to the earth itself. But, before the grass could with propriety be called materials for bonnet-making, there was the bleaching to be performed; and it was by no means certain that this could be accomplished by means of an English sun, the difference between which, and that of Italy or Connecticut, was well known to be very great.

7. My experiments have, I presume, completely removed this doubt. I think that the straw produced by me to the Society, and also some of the pieces of plat, are of a colour which no straw or plat can surpass. All that remains, therefore, is for me to give an account of the manner in which I cut and bleached the grass which I have submitted to the Society in the state of straw.

8. First, as to the season of the year, all the straw, except that of one sort of couch-grass, and the long coppice-grass, which two were got in Sussex, were got from grass cut in Hertfordshire, on the 21st of June. A grass headland in a wheat-field had been mowed during the fore part of the day;

and, in the afternoon, I went and took a handful here and a handful there out of the swaths. When I had collected as much as I could well carry, I took it to my friend's house, and proceeded to prepare it for bleaching according to the information sent me from America by my son; that is to say, I put my grass into a shallow tub, put boiling water upon it until it was covered by the water, let it remain in that state for ten minutes, then took it out and laid it very thinly on a closely-mowed lawn in a garden. But, I should observe, that before I put the grass into the tub, I tied it up in small bundles or sheaves, each bundle being about six inches through at the butt-end. This was necessary in order to be able to take the grass, at the end of ten minutes, out of the water, without throwing it into a confused mixture as to tops and tails. Being tied up in little bundles, I could easily, with a prong, take it out of the hot water. The bundles were put into a large wicker-basket, carried to the lawn in the garden, and there taken out one by one, and laid in swaths as before mentioned.

9. It was laid very thinly; almost might I say, that no stalk of grass covered another. The swaths were turned once a day. The bleaching was compleated at the end of seven days from the time of scalding and laying out. June is a fine month. The grass was, as it happened, cut on the longest day of the year; and the weather was remarkably fine and clear. But the grass which I afterwards cut in Sussex, was cut in the first week of August; and, as to the weather, my journal speaks thus:

August, 1823.

2nd.—Thunder and rain.—Began cutting grass.
3rd.—Beautiful day.

August, 1823.
4th. —Fine day.
5th. —Cloudy day.—Began scalding grass and laying it out.
6th. —Cloudy greater part of the day.
7th. —Same weather.
8th. —Cloudy and rather misty.—Finished cutting grass.
9th. —Dry, but cloudy.
10th. —Very close and hot.—Packed up part of the grass.
11th. —Same weather.
12th.
13th. Same weather.
14th.
15th. —Hot and clear.—Finished packing up grass.

10. The grass cut in Sussex was as well bleached as that cut in Hertfordshire; so that it is evident, that we never can have a summer that will not afford sun sufficient for this business.

11. The part of the straw used for platting is that part of the stalk which is above the upper joint; that part which is between the upper joint and the seed-branches. This part is taken out, and the rest of the straw thrown away. But the whole plant must be cut and bleached; because, if you were to take off, when green, the part above described, that part would wither up to next to nothing. This part must die in company with the whole plant, and be separated from the other parts after the bleaching has been performed.

12. The time of cutting must vary with the seasons, the situation, and the sort of grass. The grass which I got in Hertfordshire, than which nothing can, I think, be more beautiful, was, when cut, generally in bloom; just in bloom. The wheat was in full bloom; so that, a good time for getting grass may be considered to be that, when the wheat is in bloom. When I cut the grass in Sussex the wheat was ripe,

for reaping had begun; but that grass is of a very backward sort, and besides, grew in the shade, amongst coppice-wood, and under trees, which stood pretty thick.

13. As to the sorts of grass, I have to observe, generally, that in proportion as the colour of the grass is deep, that is to say, getting further from the yellow and nearer to the blue, it is of a deep and dead yellow when it becomes straw. Those kinds of grass are best which are in point of colour nearest to that of wheat, which is a fresh pale green. Another thing is the quality of the straw as to pliancy and toughness. Experience must be our guide here. I had not time to make a large collection of sorts, but those which I have sent you contain three sorts which are proved to be good. In my letter of the 3rd instant I sent you sixteen pieces of plat, and eight bunches of straw, having the seed-heads on, in order to show the sorts of grass. The sixteenth piece of plat was American. The first piece was from wheat cut and bleached by me; the rest from grass cut and bleached by me. I will here, for fear of mistake, give a list of the names of the several sorts of grass, the straw of which was sent with my letter of the 3rd instant, referring to the numbers as placed on the plat and on the bunches of straw.

Pieces of Plat.	*Bunches of Straw.*	*Sorts of Grass.*
No. 1	No. 1	Wheat
2 3	2 & 3	Melica Cærulea; or, Purple Melica Grass.
4 12	4 & 12	Agrostis Stolonifera; or, Fiorin Grass; *i. e.* one sort of Couch-Grass.
5 10	5 & 10	Lolium perenne; or, Ray-Grass.
6 11	6 & 11	Avena flavescens; or Yellow Oat Grass.

7 15	7 & 15	Cynosurus cristatus; or, Crested Dog's-tail Grass.
8 13	8 & 13	Anthoxanthum odoratum; or, Sweet-scented Vernal Grass.
9 14	9 & 14	Agrostis Canina; or, Brown Bent Grass.

14. These names are those given at the Botanical Garden at Kew. But, the same English names are not, in the country, given to these sorts of grass. The Fiorin grass, the yellow-oat-grass, and the brown-bent, are all called couch-grass; except that the latter is, in Sussex, called red robin. It is the native grass of the plains of Long Island, and they call it red top. The ray-grass is the common field grass, which is, all over the kingdom, sown with clover. The farmers, in a great part of the kingdom, call it bent, or bennet grass; and sometimes it is called darnel-grass. The crested dog's-tail goes, in Sussex, by the name of Hendon-bent, for what reason I know not. The sweet-scented vernal grass I have never, amongst the farmers, heard any name for. Miss Woodhouse's grass appears, from the plants that I saw, to be one of the sorts of couch-grass. Indeed, I am sure that it is a couch-grass, if the plants I saw came from her seed. My son, who went into Connecticut, who saw the grass growing, and who sent me home a specimen of it, is now in England: he was with me when I cut the grass in Sussex, and he says, that Miss Woodhouse's was a couch-grass. However, it is impossible to look at the specimens of straw and of plat which I have sent you, without being convinced that there is no want of the raw material in England. I was, after first hearing of the subject, very soon convinced that the grass grew in England; but I had great doubts as to the capacity of our sun.

Those doubts my own experiments have completely removed; but then I was not aware of the great effect of the scalding, of which, by the way, Miss Woodhouse had said nothing, and the knowledge of which we owe entirely to my son James's journey into Connecticut.

15. Having thus given you an account of the time and manner of cutting the grass, of the mode of cutting and bleaching; having given you the best account I am able as to the sorts of grass to be employed in this business; and having, in my former communications, given you specimens of the plat wrought from the several sorts of straw, I might here close my letter; but, as it may be useful to speak of the expense of cutting and bleaching, I shall trouble you with a few words relating to it. If there were a field of ray-grass, or of crested dog's-tail, or any other good sort, and nothing else growing with it, the expense of cutting would be very little indeed, seeing that a scythe would do the business at a great rate. Doubtless there will be such fields; but, even if the grass have to be cut by the handful, my opinion is, that the expense of cutting and bleaching would not exceed four-pence for straw enough to make a large bonnet. I should be willing to contract to supply straw at this rate for half a million of bonnets. The scalding must constitute a considerable part of the expense; because there must be fresh water for every parcel of grass that you put in the tub. When water has scalded one parcel of cold grass, it will not scald another parcel. Besides, the scalding draws out the sweet matter of the grass, and makes the water the colour of London porter. It would be very good, by the by, to give to pigs. Many people give hay-tea to pigs and calves, and this is grass-tea. To scald a large quantity, therefore, would require means not usually at hand, and the scalding is an essential part of the

business. Perhaps, in a large and very convenient farm-house, with a good brewing-copper, good fuel and water handy, four or five women might scald a waggon load in a day; and a waggon would, I think, carry straw enough (in the rough) to furnish the means of making a thousand bonnets. However, the scalding might take place in the field itself, by means of a portable boiler, especially if water were at hand; and, perhaps, it would be better to carry the water to the field, than to carry the grass to the farm-house; for, there must be ground to lay it out upon the moment it has been scalded, and no ground can be so proper as the newly-mowed ground where the grass has stood. The space, too, must be large for any considerable quantity of grass. As to all these things, however, the best and cheapest methods will soon be discovered when people set about the work with a view to profit.

16. The Society will want nothing from me, nor from any body else, to convince it of the importance of this matter; but, I cannot, in concluding these communications to you, Sir, refrain from making an observation or two on the consequences likely to arise out of these inquiries. The manufacture is one of considerable magnitude. Not less than about five millions of persons in this kingdom have a dress which consists partly of manufactured straw; and a large part, and all the most expensive part, of the articles thus used, now comes from abroad. In cases where you can get from abroad any article at less expense than you can get it at home, the wisdom of fabricating that article at home may be doubted. But, in this case you get the raw material by labour performed at home; and the cost of that labour is not nearly so great as would be the cost of the mere carriage of the straw from a foreign country to this. If our own people had all plenty of employment, and that, too, more profitable to them and to

the country, than the turning of a part of our own grass into articles of dress; then it would be advisable still to import Leghorn bonnets; but the facts being the reverse, it is clear that whatever money, or money's-worth things, be sent out of the country in exchange for Leghorn bonnets, is, while we have the raw material here for next to nothing, just so much thrown away. The Italians, it may be said, take some of our manufactures in exchange: and let us suppose, for the purpose of illustration, that they take cloth from Yorkshire. Stop the exchange between Leghorn and Yorkshire, and does Yorkshire lose part of its custom? No: for though those who make the bonnets out of English grass, prevent the Leghorners from buying Yorkshire cloth, they, with the money which they now get, instead of its being got by the Leghorners, buy the Yorkshire cloth themselves; and they wear this cloth too, instead of its being worn by the people of Italy: aye, Sir, and many, now in rags, will be well clad, if the laudable object of the Society be effected. Besides this, however, why should we not export the articles of this manufacture? To America we certainly should; and I should not be at all surprised if we were to export them to Leghorn itself.

17. Notwithstanding all this, however, if the manufacture were of a description to require, in order to give it success, the collecting of the manufacturers together in great numbers, I should, however great the wealth that it might promise, never have done any thing to promote its establishment. The contrary is happily the case: here all is not only performed by hand, but by hand singly, without any combination of hands. Here there is no power of machinery or chemistry wanted. All is performed out in the open fields, or sitting in the cottage. There wants no coal mines and no rivers to assist,

no water-powers nor powers of fire. No part of the kingdom is unfit for the business. Every where there are grass, water, sun, and women and children's fingers; and these are all that are wanted. But, the great thing of all is this: that, to obtain the materials for the making of this article of dress, at once so gay, so useful, and, in some cases, so expensive, there requires not a penny of capital. Many of the labourers now make their own straw-hats to wear in summer. Poor rotten things, made out of the straw of ripened grain. With what satisfaction will they learn that straw, twenty times as durable, to say nothing of the beauty, is to be got from every hedge! In short, when the people are well and clearly informed of the facts which I have, through you, Sir, had the honour to lay before the Society, it is next to impossible that the manufactory should not become general throughout the country. In every labourer's house a pot of water can be boiled. What labourer's wife cannot, in the summer months, find time to cut and bleach grass enough to give her and her children work for a part of the winter? There is no necessity for all to be platters. Some may cut and bleach only. Others may prepare the straw, as mentioned in paragraph 11, of this letter. And, doubtless, as the farmers in Hertfordshire now sell their straw to the platters, grass collectors, and bleachers, and preparers would do the same. So that there is scarcely any country-labourer's family that might not derive some advantage from this discovery; and, while I am convinced that this consideration has been by no means overlooked by the Society, it has been, I assure you, the great consideration of all with,

Sir,
&c. &c. &c.
Wm. Cobbett.

Nº II.

AN IMPROVED ENGINE FOR TRAMMING SILK.

The SILVER VULCAN MEDAL *was this Session presented to Mr.* W. V. SHENTON, *of Winchester, for an* IMPROVED ENGINE FOR TRAMMING SILK, *a Model of which is placed in the Society's Repository.*

THE only preparation which the raw silk imported into this country has previously undergone, is that of being wound off the coccoons; but as the filament of the silk-worm is of extreme tenuity, it is necessary, in the winding, to conjoin the filaments of from five to seven coccoons, in order to obtain a single thread of the requisite staple. The raw silk, thus composed, is still, however, too slender for the purposes of manufacture; and, accordingly, the first process which it undergoes is that of uniting two, three, or four threads into one, previously to giving it that kind of twist which is technically termed organzining.

The machine by which the union of the required number of threads is effected is denominated a tramming engine, and admits of a considerable variety of structure, but the conditions absolutely essential in all are the following: first, that the silk may pass off easily, and without entangling, from the delivering bobbins; secondly, that a small and equal degree of tension be applied to the threads, as they pass from the delivering bobbins to the receiving one, so that the compound thread shall be perfectly even, which obviously would not be the case if one of the component threads were quite loose while the others were drawn straight; thirdly, that the receiving bobbin cease to revolve as soon as any one of the component threads happen to break, an accident which not unfrequently occurs, as, without such contrivance, a thread would be produced of variable thickness, from the casual omission of one or more of the component threads.

The operation of tramming, in some of the best constructed mills, is performed in the following manner:—

The delivering bobbins (varying in number from two to four, according to the intended thickness of the compound thread) are placed upon as many vertical spindles, the vertical position allowing the threads to quit the bobbins without any motion or revolution of the bobbins themselves. Some way above the bobbins the threads pass singly between two horizontal slips of cloth or felt, which, by their friction, give at the same time a certain degree of tension to the threads, and clear them from any dust or other light matter. Each thread then passes through the eye of its own drop-wire, whence they all converge and unite in the eye of the *guider*, from which the compound thread is distributed on the surface of the receiving bobbin as it revolves. Each drop-wire consists of a piece of wire turned up so as to form a right angle, of which the vertical leg is about two inches long, and is terminated by an eye, through which the thread passes, and the horizontal leg is about four inches long, terminating likewise in an eye, through which passes a pin, connecting all the four drop-wires, and forming a pivot on which each is capable of moving freely. Each thread, in passing through the eye of its drop-wire, slips down a little, and being in a state of moderate tension, supports it at the elevation of half an inch or more above the position to which it would otherwise descend. When, therefore, a thread breaks, its drop-wire immediately falls and strikes on the edge of a wire frame moving on a horizontal pivot, and so adjusted that the weight of the drop-wire immediately inclines downwards that side which it touches, and, consequently, raises the opposite side. To this opposite side a tail of wire is attached, which, when raised, catches on a kind of ratchet-wheel fixed on the same spindle as the receiving bobbin, and, consequently, stops it. The broken thread being repaired, is again passed through the eye of the drop-wire and supports it above the frame; the opposite end of the frame then becomes preponderant, the tail or stop descends out of the way of the ratchet-wheel, and the revolution of the receiving bobbin immediately re-commences.

This apparatus is very simple and efficacious, but is liable to two inconveniences; first, that the thread usually breaks close to the pieces of cloth by which it is compressed, and some trouble and loss of time are occasioned in drawing the thread out previous to tying it; secondly, that when a smaller number of threads than four are trammed, the vacant drop-wires must be removed, otherwise, their unsupported weight would, as above described, throw up the stop, and prevent the revolution of the receiving bobbin.

The contrivance by which Mr. Shenton effects the operation of tramming, and avoids the above-mentioned inconveniences, will be evident by referring to plate VIII, of which

Fig. 1, is an end view, and fig. 2 a bird's-eye view of his machine, the same letters of reference denoting the same parts in all the figures.

a a, the axis which gives motion to the receiving bobbins, *f f*, by means of wooden rollers, *d d*: they are made of any required length, to suit a continued series of succeeding bobbins, with a roller under each: the wooden axis which carries the receiving bobbin has a leaden roller, *e*, fixed on it, which receives motion by mere contact, on account of its weight. This axis is shown separate in fig. 3. *p p* are two pins fixed in the leaden roller *e*; *s*, another pin, or hook, which holds on the bobbin by hooking under the staple, *t*, of the bobbin, figs. 3 and 4; as the receiving bobbin revolves, it draws the threads from two, three, or four bobbin *g g g g*, as previously determined, and, in order to lessen the friction of these bobbins, which are fitted on wooden pins, *u u u u*, the pins are perforated, and ride upon a wire, *v*, and the bottom of these pins, and the loops which hold the wires, are rounded, leaving just friction enough to keep the threads extended: they are shown separate in fig. 5. Now, should any one of these threads break, it is requisite that the receiving bobbin should immediately stop; for this purpose, a crank wire, *m*, with a catch, *n*, and a fixed crank, *o*, is placed near each roller; on this four light drop-wires, *k k k k*, swing freely, and they have eyes to hang on the threads, which are their only support (these wires are shown a quarter their real size in fig. 6); now, should either of the threads break, the drop-wire which hung on it would fall on the crank, *o*, and cause the wire, *m*, to revolve, and bring the catch, *n*, forwards from its position, fig. 8, to lay hold of the pin, *p*, of the roller, *e*, as shown in fig. 7, and stop it immediately; then, as soon as the thread is mended, the thumb is laid on the tails, *w*, of the drop-wires, to bring up the fallen one; the thread is then put in the eye and the catch is withdrawn by turning back the end *m*, of the crank wire, and the work goes on; there are two spare notches, *x x*, to lay the bobbin in while joining the thread, that it may be out of gear and move freely till set right by hand. Now the silk threads, on leaving the bobbins, *g g g g*, pass separately over a glass rod, *i*, and through the eyes of the drop-wires, and then gather together in passing through the eye of the guide wire, *b*. In order to distribute equally over the bobbins the silk threads thus gathered together, an alternating motion is given to the sliding bar, *c c*, which carries the guide wires, *l*, by means of a pin, *r*, working in an oblique or spiral groove in the block, *b*, fixed on the end of the axis, *a*, and the obliquity of this groove corresponds with the length the silk is to be distributed on the bobbin, and, therefore, causes the sliding bar to move to and fro that length every turn of the wooden roller, or every four turns of the bobbin, the bobbin rollers being one quarter the size of the wooden rollers, *d d*.

The bars, *h h h h*, which support the supplying bobbins, are so placed as to make the bobbins stand at right angles with the thread, when it passes from their middle to the glass rod.

It is best to make the four eyes of the drop wires lie parallel to the glass rod, as their vibrations on the threads will be more equal.

Figs. 8 and 9 show the tinned iron facings which are coiled round under the bars at *y* to support the crank wire.

Fig. 10 shows how the guide wires are bent and fixed in the sliding bar.

q q, fig. 2, are two sliding wires; it will be seen that where four threads are tramming, it is drawn back, but where two threads are tramming, it is pushed in to support the two drop-wires that are out of use, and prevent their acting on the crank wire.

Fig. 11 shows the manner of riveting the wooden-rollers on the axis, by cutting up a burr with a chisel, on the angles *z z*. Figs. 1 and 2 are a guard rail.

Figs. 1 and 2 are one-sixth, the others one-fourth the real size.

PAPERS

IN

MECHANICS.

N° I.

TAP FOR CUTTING HOLLOW SCREWS.

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The Silver Vulcan Medal *and* Five Guineas *were this Session presented to Mr.* Siebe, 406, *Strand, for his* Tap for cutting Hollow Screws. *A Model of his Apparatus has been placed in the Society's Repository.*

SCREWS vary from each other, not only in magnitude, but in the direction and complication of their threads; hence there are right and left-handed screws, also single, double, and treble screws. The apparatus of Mr. Siebe enables the workman, with the same tool, to form either right or left, single, double, or treble, hollow screws of the same diameter. The screws capable of being made by this implement are very far from being mathematically accurate, but will be found to be quite as good as the hollow screws made in the usual way, and adapted to the purposes of various wooden articles of domestic furniture, and to the commoner kinds of machinery.

The tap is a thin, quadrilateral piece of steel of the length and breadth of the required screw, having its longitudinal edges cut into saw teeth, the teeth in one row being opposite to the intervals in the other, and, therefore, representing the section of a screw, the teeth being sections of the threads. A cylinder of hard wood is turned so as to correspond with the dimensions of the intended screw, and a longitudinal piece having been cut out from the middle, representing a section through the axis; the serrated plate of steel is to be inserted and firmly riveted into its place. The cylinder terminates in a flat head, for the purpose of receiving a key, or lever, in order to overcome the friction experienced in cutting the screw.

In order to use this tool, a cylindrical hole, equal in diameter to the cylindrical stem, is to be bored in a piece of wood, and the serrated cylinder being then introduced, giving to it a circular or spiral motion, will form a right or left-handed screw, according to the direction in which it is turned; and, by entering two or three threads at once, by means of a very simple cutter, fig. 5, the same tap will give a double or treble-threaded screw.

Reference to the Figures of Mr. SIEBE'S *Universal Screw Tap—Plate VI.*

Fig. 1, the tap for wooden screws; it is composed of a cylinder of hard wood, *a a*, sawn down the middle, as fig. 2, and of a steel blade, *b b*, fixed in by two or more rivets, *c c*. The hard wood being first made into a screw the blade is riveted in, and the teeth are filed to fit the wooden threads; the blade is then removed, the threads are just turned off, leaving the stem cylindrical; the blade is then tapered at the point, so that the first teeth are no bigger than the cylinder, as fig. 3, and is again riveted in its place. Fig. 4, is an end view; the cylinder is cut away a little at *d d*, to make room for the shavings: as the cylinder fits the hole and the blade is taper, it secures a gradual and steady cut, which may be either to the right or left hand.

Fig. 5 is a V tool (*e* is a section of its cutting edge) to begin the thread in order to get the proper lead, it is most needful in the double or treble threads.

Fig. 6 shows a treble-threaded hole; a cut is made at 1 and then a cut is made at 2, which shall slope under 1, leaving one thread; then a cut is made at 3 to slope under 2, which, if continued, would leave two threads under 1, and three threads under 3, giving the lead for a treble thread.

Fig. 7 shows a steel tap for metal screws.

Fig. 8 is an end view, showing how it is filed away to leave the threads on each side, like teeth, quite sharp; it is first tapped like a plain screw, with the threads at *f* turned off; it is then filed square, and the threads (or teeth as they may now be called) at two opposite angles are filed away, to coincide with the plain part at *f*; these taps cut better, the nearer the plain part fills the hole. Above fig. 6 is shown a hole in the screw plate with two sloping notches, which do not pass the bottom thread.

Nº II.

IMPROVED MANGLE.

The SILVER VULCAN MEDAL *and* TEN GUINEAS *were this Session presented to Mr.* ELISHA PECHEY, *of Bury St. Edmund's, for an* IMPROVED MANGLE, *a Model of which is placed in the Society's Repository.*

THE novelty in Mr. Pechey's mangle is the contrivance for obtaining the alternate forward and backward motion of the box, and consequently of the rollers, by continually turning the winch in the same direction. More than one mode of obtaining this object is already before the Society, but the simplicity, ingenuity, and perfect efficacy of the arrangement adopted by Mr. Pechey for this purpose, will be apparent from the following description :—

Plate IX, Fig. 1, is a plan or view of the upper side of the mangle.

Fig. 2 is an end view.

Fig. 3 is a side view; the bottom parts of the frame being represented as broken off, so as to reduce it within the plate; but the whole height is seen in fig. 2.

The same letters of reference apply to the same parts in each figure.

Fig. 4 is a section of a double rack, *a a* and *b b*, together with the plummer blocks, or guides, *c c* (which support and guide the rack, or axis, *d d)*, being cut by a plane in the direction of, and perpendicular to the axis.

Fig. 5 is a similar section, shewing the rack in another situation, as will be hereafter described.

Fig. 6 is a view of part of the shaft *d d*, showing the two journals *e e*, which turn and are supported in the plummer blocks, and also the pinion *f* of three teeth, formed in the middle part of the shaft which works into the racks.

Fig. 7 is a section of the plummer block, cut in the direction of the dotted line *g g*, fig. 4, and of the pinion *f*, together with a side view of one end of the racks *a a* and *b b*.

Figs. 4, 5, 6, and 7 are drawn double the size of the former.

A A &c. is the frame of the mangle, B B the moveable box which contains heavy weights, and C C two rollers, which are all made in a similar way to other mangles.

On the upper side of the frame A A, &c. are fixed head stocks D D, which are fixed and kept perpendicular to each other by an iron bar *h h;* on the upper side of the bar are fixed the plummer blocks *c c;* the upper and lower parts of the plummer blocks have projecting pieces, *i i* and *j j*, which support and guide the double rack, see figs. 4 and 5. *a a* and *b b* is the double rack, which is fixed parallel to the box B B, by means of two perpendicular studs, *k k*; the studs pass loosely through loops in each end of the racks, so that the rack is at liberty to move up and down, being at the same time prevented from sliding off by the pins *l l;* each end of the rack is supported by two spiral springs *m m* fixed on the upper side of the box; the ends of these springs pass through small holes in the ends of the rack, and tend to support it in a middle situation, such a position as that the pinion *f*, fig. 7, shall be in gear with the upper bar of the rack. The double rack consists of a flat bar of iron, having teeth formed in the internal part of it (as shown in figs. 3 and 7), and also two fins, or ribs, *n* and *o*, fixed to the upper and lower edges of it, and projecting on each side of the rack. The use of these fins is to support the rack in the two situations, as shown in figs. 4 and 5. *d d* is a shaft, or axis, which is supported by the head stocks D D, and by the plummer blocks *c c*, having a fly-wheel *p* fixed to one end of it, and a winch *q* to the other, by which means the machine is put in motion: in the middle part of the shaft *d d* is the pinion *f*, which works in the teeth of the rack; in figs. 3 and 7 the pinion is represented working in the upper rack *a a*; now, suppose a rotatory motion be given to the winch, the pinion will cause the rack, together with the box, &c. to move in a longitudinal direction till the end of the rack has arrived at the pinion, when it will be seen, by referring to fig. 7, that the rack cannot pass any further in that direction. By continuing to turn the winch in the same direction as at first, it is evident that the next tooth of the pinion will take into the gap in the end of the rack, and thus cause the rack to slide up the stud *k*, till the fins on each side of the rack are raised above the projecting pieces *i i* and *j j* of the plummer blocks: the next succeeding tooth will act in the first gap of the lower rack *b b*, which will cause the rack, together with the box, &c. to move in the contrary direction till the other end of the rack has arrived at the pinion, when a tooth of the pinion will act in the gap in that end and cause the rack to slide down the stud *k*, when the next tooth of the pinion will act in the first gap of the upper rack and cause the rack to move in the direction first mentioned, and, by continuing the motion of the winch in the same direction, an alternate motion of the rack box, &c. is effected.

To replace or change the rollers C C, one of the arms *r* or *s* must be turned on the joint by which it is fastened to the plummer-block in a direction parallel to the side of the rack, as shown at *r* in fig. 1.

The arm forms an inclined plane as shown at *r*, fig. 3, so that when the end of the box B B approaches towards the center of the frame, the friction-roller *t* (one of which is fixed to each end of the box), passes up the arm or inclined plane *r*, and raises the end of the box, so that the roller C may be removed.

N° III.

CENTRIFUGAL CHECK-HOOKS.

The SILVER VULCAN MEDAL *was this Session given to* ED. SPEER, *Esq. of New Inn, for his* CENTRIFUGAL CHECK-HOOKS, *a Model of which have been placed in the Society's Repository.*

THE contrivance here described formed part of an apparatus for the prevention of accidents in raising men or minerals out of mines by means of a rope and bucket. The idea of centrifugal check-hooks appearing to be new and applicable in other machines for the purpose of stopping them when put into inordinate motion, or *running wild* as the phrase is, the Society directed that this particular contrivance should be inserted in their printed Transactions.

Fig. 1, Plate X, is a front view, and fig. 2 is a side view of the apparatus; *a a* a bar fixed on the end of the axis *d*, fig.

2; *b b* two hooks swinging freely on the ends of the bar *c*, a short bar projecting from the frame of the machine for the hooks to catch hold of. When the bar *a a* revolves moderately, the hooks *b b* hang down by their own gravity and keep clear of the bar *c*, but when it revolves too quick the centrifugal force causes them to diverge, as shown by dotted lines, and one of them catches hold of the check-bar *c*, and stops the revolution of the axis entirely.

Nº IV.

ARM-CHEST.

The LARGE SILVER MEDAL *was this Session presented to* R. S. WILKINSON, *Esq. Capt. R. M. Chatham, for* AN ARM CHEST FOR THE USE OF MARINES, *a Model of which has been placed in the Society's Repository.*

THE arm-chests on board ships of war appropriated to the marines are mere boxes in which the arms and accoutrements are deposited indiscriminately, so that it is not possible for the commanding-officer duly to inspect them or to render the men individually responsible for their condition.

Besides these serious inconveniencies it perpetually happens when a sudden alarm is given (especially at night) that the men rush to the arm-chest, take the musquets out as quick as possible, and in doing so run the imminent hazard of wounding each other, and of injuring the arms in the confusion. This was experienced by Capt. Wilkinson in an action with two French frigates, and induced him to fit up an arm-chest on a new construction, which having met with the full approbation of his brother officers he has been induced to submit to the Society.

The size of the chest varies according to the number of arms that it is intended to hold. The upper part is separated from the lower by a strong wooden bottom, and forms a box divided into five or six compartments for the reception of cartouch-boxes, belts, and spare ammunition. The lower part of the chest has two opposite sides formed into folding doors, which not only renders it very accessible but by means of the thorough light allows the commanding officer a clear and accurate inspection of its contents. The musquets are placed in this compartment, each piece having its own bayonet reversed on the muzzle; they are placed on horizontal grooved bottens, and hang with their locks downward, presenting butt and muzzle alternately.

Plate X, fig. 3, is a perspective view of the chest shut up as it stands on the deck.

Fig. 4, is an elevation of the same front with the two lids *e* and *f* opened back to back, and the front flap *g* turned up and secured to the lids at *i i*, by which they all hold each other up; the flap *h* opposite to *g* turns up in like manner, as the back is exactly like the front; in this view are seen four rows of musquets supported in notches in the four bars *k k*, *l l*, *m m* and *n n*, lying butt and muzzle alternately; the former put in at the side *g*, the latter at the side *h*, the depth of the chest being the length of a musquet.

Fig. 5, is a longitudinal view of the musquets, showing the position in which they lie, with the locks downwards and the bayonets reversed.

Fig. 6, is a plan of the top part (a section of which is shown fig. 5), containing the belts and cartouch-boxes, and a case at each corner for spare cartouches. The lids *e* and *f*, seen in the other figures, lift up to get at the belts and cartouches, and the flaps *g* and *h* to get at the musquets.

N° V.

APPARATUS FOR FRACTURES OF THE LOWER LIMBS.

The GOLD VULCAN MEDAL *was this Session presented to* JOSEPH AMESBURY, *Esq. M. R. C. S. of Great Surrey-street, Blackfriars, for* AN APPARATUS TO BE APPLIED IN CASES OF FRACTURE OF THE LOWER LIMBS. *The following Communication has been received from Mr. Amesbury on the subject, and a set of the Apparatus has been placed in the Society's Repository.*

82, Great Surrey-street,
Blackfriar's-road.

SIR;

ALLOW me to request you to lay before your Society the accompanying apparatus which I have contrived for the treatment of fractures, both simple and compound, of the lower limbs; and also for the treatment of dislocations of the ancle and injuries of the knee: and to make the Society acquainted with the contents of the paper which you will receive with this communication, as far as they may tend to elucidate the effects of the apparatus and show its advantages over the various splints and machines in common use.

I am, Sir,
&c. &c. &c.
J. Amesbury.

To A. Aikin, Esq.
Sec., &c. &c.

Fractures and dislocations are regarded to be accidents of considerable importance both by the profession and the public. In the opinion of the profession, they are placed high in the scale of those injuries which stand in need of surgical assistance. The public believe a fracture to be a case of great moment; perhaps because they know that the patient usually suffers much pain in the injured part, and is under the necessity of submitting to considerable confinement; or, it may be, from the knowledge that the bones sometimes cannot be made to unite; and that they sometimes unite in such a manner as to leave the patient the subject of lameness, and of incurable deformity for the remainder of his life. Daily observation is sufficient to convince us of the manifold evils which accrue to society from the improper union of fractures. Much has been said upon this subject by men of great natural talent and professional acquirements, but though their observations have added considerably to our knowledge in this department of surgical science, I am disposed to think that they have left much for their successors to accomplish.

Feeling convinced of the imperfection of the plans which are commonly resorted to in the treatment of fractures of the lower extremities, I have been led to adopt a practice which I believe will be found to differ materially from any that has been hitherto pursued. The plan of treatment to which I allude, has for its object the prevention of deformity and non-union; and also to add to the comforts of the patient during the period necessarily required for the union of the bones. It consists principally in the employment of a new apparatus which is calculated to secure the fractured parts in their natural position, and to prevent them from moving upon each other. The degree of perfection to which I have now brought the apparatus that I employ in the treatment of those accidents, enables me to lay it before the members of the Society of Arts, with a hope that its utility will be found sufficiently supported to bear their fullest investigation.

In order, however, that the unprofessional members of the Society may be enabled to form some notion of the effects of the apparatus which I do myself the honour to submit to their inspection, it is proper that they should be made acquainted with the leading indications which we have to attend to in the mechanical treatment of those injuries for which the instrument was designed.

The motions of the trunk and limbs are performed by the action of the muscles upon the bones, which form the support or frame-work of the body. The action of the muscles, which produce these movements, is voluntary or the effect of volition. But, muscles have besides a power of acting independently of the will, and this power is constantly exerted in a tendency to approximate their points of attachment. This, in its natural or ordinary degree, is called the tonic power of the muscles; but when inordinate it is denominated spasm.

It is not the exertion of the voluntary power that a surgeon has to fear. A man with a broken leg or thigh does not willingly put the muscles of the limb into action, because he is aware that any attempt to move the limb would give him pain; not only at the moment, but more remotely, by producing derangement in the fractured parts. It is the latter mode of action, which is increased by mechanical or other stimuli, that a surgeon has to dread in the treatment of fractures. This operates materially in producing shortening of the limb. It has a constant tendency to displace the fragments; and its effects are the more injurious, in proportion to the obliquity of the fracture. The slightest riding of the bones increases its activity. Over it the patient has no control, and the surgeon has too often found it frustrate his best curative intentions.

As the action of the tonic power of the muscles is increased by any thing that irritates their bellies; and, as it is by the action of this power, principally, when no longer resisted by the contact of the bony surfaces, that shortening of the limb is effected, it is evident, that all those causes which tend to produce derangement of the fracture and to separate the fractured surfaces from each other in the transverse direction, should be, if possible, avoided, even if it were for no other reason than to guard against shortening of the limb. But, however attentive the patient may be, he is not able to prevent the derangement of the fragments of a fracture; for when a limb is broken it is no longer under the command of the patient's will; the fracture, therefore, is liable to be displaced by a variety of external causes, the action of which the patient is not able to resist from any power that may be still inherent in the injured limb. Among these causes are the different movements made in the body to answer the calls of nature, inadvertent movements in the limb itself, &c.

From what I have said, it will be seen that the principal causes which produce derangement of a broken bone, are mechanical forces foreign to the injured limb, and which for the most part are purely accidental; and those more important causes arising from the tonic contraction of its muscles.

After a surgeon, therefore, has reduced a fracture, he should turn his attention to the means of guarding the fractured parts against the influence of accidental or intentional changes in the position of the body, and the effects of any impetus given to the limb itself below the site of fracture. He should take care that his means possess the power of resisting the involuntary action of the muscles. He should also consider in what way these indications can be answered with the least possible inconvenience to the patient, and at the same time in such a manner as is calculated to give him every advantage which is likely to insure a proper and speedy union of the bones. Some mechanical contrivance which would enable the surgeon to effect these purposes, has been long a desideratum; any attempt, therefore, however humble, which has for its object this accomplishment, has some claim to the notice of scientific men.

It is not necessary that I should take up the time of the Society by entering into a detailed account of the various splints and machines that have been invented for the treatment of fractures, since it is to be presumed that the ordinary means are the most approved. But these, concerning which I shall say a few words, I may venture to assert, are, in many cases at least, inadequate, even in the hands of the most competent and skilful surgeon; and in all cases uncertain in their effects.

The pieces of deal which are usually called short splints, when used in the treatment of fractures of the thigh, have but little effect in guarding the fractured parts from motion; or in guarding them from being displaced by the motions of the body; or by any accidental impetus given to the limb below the fractured part. This, I think, will appear from the first experiment related in my observations upon fractures of the lower extremities, and also from the experiments related in my observations upon fractures of the arm. When they are made use of for fractures of the leg, the same observations will apply, though not so forcibly. Besides, there is nothing in the construction to support the heel or sole of the foot, consequently, if the fracture is loose, displacement will take place; and, if the fracture extends into the ancle joint, the bone may unite in such a manner as to produce that permanent extended state of the foot upon the leg, which is usually denominated pointed toe. Again, there is nothing in their construction which is sufficient to prevent the occurrence of eversion of the foot, consequently, we frequently see patients who have been treated with these splints, ever after walk with the inside of the affected foot turned forward. Further, it is generally necessary to keep up extension in the treatment of fractures of the thigh; and frequently in the treatment of fractures of the leg; but there is nothing in the form or mechanism of the short splints which is capable of doing this.

In order to overcome the difficulty which arises from the retraction of muscles, surgeons have adopted what is called the long splint. This is placed along the outer side of the limb, so as to keep up extension between the hip bones and the foot. There are several varieties of the long splint, but all that I have yet had an opportunity of examining, fall far short of answering the indications which present themselves. The inventors, it would seem, have confined themselves to the mere idea of keeping up extension, with but little regard to the form or mechanism of the limb. Hence we perceive that, though any one of them may occasionally answer, they must all, from their very nature, be often insufficient, and frequently injurious. Thus we see that the long straight splint with a screw, tends, by its action, to keep the fractured surfaces from each other, when used in the treatment of fractures through the neck of the thigh bone; and, therefore, instead of assisting nature to bring about an union, it tends to prevent it; and may be often a cause of non-union in fractures that, with more favourable means, may be made to unite. Again; when used for fractures extending through the lower end of the thigh bone, its tendency is, to leave the patient lame for ever after the cure is effected, from the position in which it causes the bone to unite. Many other evils attending the use of the long splint may be pointed out, equally injurious to the patient; but those I have mentioned are sufficient to show that it must frequently fail to produce the beneficial effects which the surgeon should have constantly in view. Yet this splint is generally considered the best that has hitherto been used in order to prevent shortening of the limb.

Many of the evils which arise from the use of this splint are produced by the straight position in which it must always confine the limb. Some surgeons are aware of this; and being fully sensible of the advantages which accrue to the patient from bending the limb, in certain cases, they make use of what is called the fracture box, or the double-inclined plane. Both of these contrivances are constructed upon the same principles; and the chief difference in them consists in the introduction of a foot board in the fracture box; but this is made in such a manner that it can have no other beneficial effect than to keep the foot from falling to the inner or outer side, and to support the sole. Both of these apparatuses have some advantages over the short splints, and also over the long splints in some cases; but even in the treatment of those cases for which they are considered most applicable, their employment is frequently attended with disadvantages that materially militate against their use.

It may not be improper to state, that the apparatus called the double-inclined plane, consists of a frame and of two pieces of board, fastened together in the middle by a hinge. One end of one of these boards is connected by means of a hinge to one end of the frame of the apparatus; the other board is left unconnected at one end, so that it may be made to form an angle of any degree with the board to which it is attached at the other. When the surgeon has found the angle which he thinks most advisable for his case, he may fix the two planes at that angle upon the frame, by means of a rack placed there for the purpose.

The fracture box and the double-inclined plane are principally used in the treatment of fractures of the thigh; and when either of them is employed in the treatment of these accidents, it is intended that the thigh shall be fixed upon the apparatus. This intention is not answered, because the weight of the trunk causes the bed to yield under the nates; while the wide frame of the fracture box, or of the double-inclined plane, prevents it from sinking in the same proportion. This alteration in the relative position of the body, with respect to the apparatus, is followed by a variety of injurious consequences. If the apparatus is placed so as to support the back of the thigh at all, the upper part of the limb is forced against its corresponding end; and the pressure thus produced, frequently occasions pain, tumefaction, and sometimes abscess, at the upper and back part of the thigh: and if the fracture is high up, the action of the flexor muscles of the thigh, assisted by the pressure of the apparatus, frequently produces displacement of the bone in the transverse direction; and, as soon as this is effected, the muscles, which bend and extend the leg upon the thigh, being no longer resisted by the contact of the fractured surfaces, act upon that part of the limb which is below the fracture, so as to keep it close upon the apparatus; while the trunk, by its own gravity, sliding towards the foot of the bed, forces down before it that part which is above the fracture. Thus the upper portion of the bone is made to press the lower; which, compared to the upper portion, may be said to be fixed upon the apparatus. The displacement which follows the combined operation of these causes, is too often productive of great and permanent shortening of the limb, great deformity and lameness. The results which daily follow the use of these contrivances, show that they have but little influence in preventing displacement of the broken extremities of the bone. Again; even if no other mischief should occur, when the patient raises the hips to answer the calls of nature, the upper fragment, following the direction of the pelvis, is raised from the apparatus, and motion is produced in the seat of fracture. This motion frequently produces pain, and much retards the cure. Hence it may be seen, that there is little dependance to be placed upon the support which is given to the limb by the fracture box, or the double-inclined plane, in the treatment of fractures of the thigh. Further; it is often necessary to keep up a steady extension when the limb is placed in the bent position; but in what way this can be done by the fracture box or the double-inclined plane, I am ready to confess myself at a loss to determine.

I have now endeavoured to give the Society a general notion of the effects of those means which are usually resorted to in the treatment of fractures of the lower limbs, and also in the treatment of dislocations of the ancle. I might have mentioned many other contrivances which have from time to time laid claim to notice; but, as those I have touched upon are the most approved, I may be allowed to pass over the others in silence.

What I have stated respecting those contrivances in common use, will be sufficient to show that some improvement in the treatment of fractures was required.

Strongly impressed with the importance of these accidents, both to the surgeon and to the patient, I was led to contrive an apparatus for the treatment of them, upon principles which to me are new. The principles of this apparatus, and the advantages it gives to the patient, as well as to the surgeon, I shall now attempt to describe.

In my observations upon fractures of the lower extremity, I have endeavoured to show, that, in the treatment of those which occur in the leg and thigh, it is proper to fix the whole limb as far as the hip joint; and that in certain cases it is advisable to fix the pelvis also. The first of these principles my apparatus is capable of effecting; and the second it accomplishes by the assistance of a bandage.

By this apparatus the limb can be fixed in such a manner that, if the fracture is not through the neck of the bone, or the trochanters, which are parts contiguous to the neck, it may be made entirely passive to the motions of the apparatus, whenever an impetus is given to it, either above or below the situation of the fracture, and so as to allow of the total motion of the limb in the hip joint; at the same time that it prevents any motion between its parts.

Hence we see that, when the fracture is through any part of the limb below the upper third of the thigh, any motion given to the pelvis, as in the act of raising it to answer the calls of nature, and in the act by which the patient draws himself up in bed to obtain relief from any uncomfortable position, motion is given to the instrument; and by it, passively, to the limb; which, however, does not feel it in any particular part, but as a whole, from the hip joint to the very sole of the foot. Again, the limb may be passively rested upon the bone to which it is connected, without producing any motion in the situation of the fracture; and this is the case, whether there exists one fracture or a dozen.

In most fractures of the thigh, when the limb is bent, the power of those muscles, which have the greatest tendency to displace the fragments, is much weakened; but yet, by what is called their tonic power, they are capable in many cases, of acting sufficiently to produce considerable displacement of the fragments. From this we may learn that something is required to resist the acting even of those muscles which are so placed upon the limb as to admit of being greatly weakened by position. In some cases, the straight position is the best for the surgeon to adopt. But whether the fracture be such as would render it most advisable to place the limb in the straight position or in the bent, a steady resistance to the action of the muscles is generally required. Fractures of the leg too, which pass through the bone in an oblique direction, require the application of a steady extending force to prevent shortening of the limb. But this can not be done with any of the ordinary contrivances, with a proper regard to other indications.

The apparatus which I forward for the inspection of the Society, is so contrived, that it admits of being altered in such a manner, that it can be made to act according to the situation or nature of the accident; and, I trust, will be found capable of resisting the action of those causes which are so frequently productive of deformity and lameness.

In order to enable the Society to judge more clearly, how far my apparatus may be worthy of the notice of the profession and the public, it will be proper for me to enter a little into detail. In doing this, I will briefly relate some cases, by way of illustration; which I shall choose from among those that have been treated with my apparatus in public hospitals, in preference to those that have occurred in my private practice.

In the treatment of all cases of fracture through the upper third of the thigh, I may say, that the action of this apparatus is more complete than that of any other which I have seen employed.

When used in the treatment of fractures through the neck of the thigh bone, it may be made to keep the injured limb as long as the other, to support the limb in a proper relative position with the bones to which it is naturally connected, to prevent the foot from becoming everted, and to keep the broken ends of the bone closely applied to each other. These effects all tend to the same beneficial result, viz., to assist nature in her efforts to consolidate the bone. They are advantages, which, collectively taken, cannot be obtained by employing any of the ordinary means; nor in my humble opinion, if it were possible, all of them together. We have only to fix the lower part of the body, and, with my apparatus, every other indication which I have noticed may be fully answered.

But though I should always advise the lower part of the body to be fixed, in such cases, as a precautionary measure, it does not appear that it is essential to do so in every instance, where my apparatus is employed.

When the apparatus is used in the treatment of fractures which extend through the bone just below the parts contiguous to the neck, it admits of being adjusted at any angle the ceas may require. It thus enables the surgeon to weaken the action of those muscles which tend most to displace the fracture, and, at the same time, by being placed so as to keep up a steady extension, it prevents the limb from becoming shortened although it be fixed in the bent position. It also keeps the fractured surfaces closely and steadily applied to each other, and prevents the foot from becoming everted. It has the advantage too, even in this situation, of enabling the surgeon to relieve his patient, in some measure, from the irksomeness of confinement, by allowing him to have his bed made occasionally, and to have clean linen as often as he wishes. But the advantages which are gained from the use of the apparatus in the treatment of such cases, may be rendered more apparent and more satisfactory by giving an example.

A man, aged 51, fell over a tub and broke his thigh across the upper third.* He was admitted into Guy's hospital, under the care of Mr. Foster, and the usual splints were employed; but he suffered greatly from their use, and they all failed to keep the bones in proper opposition. On the tenth day, the bones over-lapped so as to make the fractured limb from two to three inches shorter than the sound one. There was also an angle formed at the seat of fracture which might be represented by the elbow when the arm is bent. My apparatus was now applied, and was kept upon the limb for a month; when it was taken off, and the bone was found united. The limb which had been fractured, was now of the *same length as the other*, and there was not the least apparent deformity in any way.

His bed was made two days after the apparatus was applied, and this was repeated at the end of a fortnight. The limb could be rested upon the bone to which it is connected, without giving him pain or disturbing the fracture. He could draw himself up in bed, without experiencing any sensation of motion or of displacement in the injured part.

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* From one inch and half to two inches below the trochanter minor.

Fractures of the thigh most commonly occur through the middle third, and I think we may average as many fractures below the middle third as above it; I will, therefore, assume that four fractures of the thigh out of five, occur below the upper third; and, I think, I am much within the number. Now, in addition to the advantages above stated, when my apparatus is employed, a patient, with any kind of simple fracture of the thigh through the middle third, may not only have his limb passively moved as often as he wishes, but, in many cases, he may, with common care, turn in bed without retarding the cure, and without any danger of disturbing the fracture.

A man, aged 20, was admitted into St. Thomas's Hospital, with a fracture of the thigh. He had fallen under a waggon containing a load of about two tons; and the wheel, passing over the thigh, occasioned a fracture across the middle third. Two days after the accident the apparatus was applied; and he was desired to place the limb either on the heel or on the side, as he felt one or the other of these positions most easy to himself; and to alter it from one to the other, at pleasure; and also to have his bed made every other day. This mode of treatment was followed for a month; and, at the end of this time the bone was united. He now got up with the apparatus on, sat in a chair or walked about the ward with the assistance of crutches. Three days after this the apparatus was taken off; and, at the end of six weeks from the time of the accident, he was able to walk with the assistance of a stick;

and, at this time, not the least shortening or deformity could be discovered.*

With respect to the fractures that occur through the lower end of the bone, and which are, by many, considered incurable without great deformity and lameness, I may say, that the apparatus is as capable of producing the same happy results, as in those cases which take place through the middle of the bone. But lest I should be looked upon as tedious, I will leave the consideration of fractures of the thigh, to say a few words relative to its effects in the treatment of those which occur in the leg.

When the apparatus is used in the treatment of simple fractures of the leg, the patient may get up a few days after the accident (the time being regulated by the surgeon), and, with common care and attention, he may walk about with the assistance of crutches, without any danger of deranging the fracture or of producing deformity in the limb.

Some surgeons consider, that a patient with a broken leg should not be allowed to get up so soon; because, in their opinion, the practice would produce great irritation and retard the union of the bones. But both of these objections are purely hypothetical. I may answer the first by inquiring, Why then allow a patient to get up with a fractured arm? And the second, by the following case:

A man, 55 years of age, was admitted into Guy's Hospital, with a fracture of both bones of the leg through the lower third. The fracture of the large bone extended obliquely into the ancle joint. The accident was occasioned by a fall from the step of a carriage. The apparatus was applied; and the man was up on *the third day;* and on the fourth from the time of the accident, he began to walk about the ward with crutches. On the twenty-fourth clear day after the accident, the bones were found firmly united; and at the end of the fifth week, just at the time he might with the common treatment have had his bed made for the first time—he was able to walk across the ward without crutch or stick.

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* The time of confining a patient with a fractured thigh to his bed, under the usual treatment, is, generally, from six to eight weeks; and during this period, which is often much prolonged, he is not permitted to alter the position in which he is first placed, or to have the limb moved, except with a view to re-set the fracture when it gets deranged.

This man got well much within the usual period, without any unpleasant symptom, without deformity or lameness; and his case, to which many may be added, must be regarded as a proof in favour of the practice of allowing patients to be about before the bones are united.

As a contrast to this, I may give the case of a man, about 30 years of age, who was admitted into St. Thomas's Hospital with a fracture of both bones of the leg. The apparatus was applied on the fifth day from the time of the accident, and he was suffered to lie in bed, in one position, for *eight weeks;* and, *at the end of this time,* though he remained quiet and had his bed made only once during the eight weeks, *the limb was not united.* He was now allowed to get up with the apparatus on, and walk about with the assistance of crutches; and, under this treatment, the bone united firmly.

This case occurred in a fine young man, possessing a healthy constitution; he had no infirmity which tended to retard the union of the bone. It will be recollected that the same apparatus was used in both cases. If we take the ages of these two men into consideration, we shall find that the bones of the latter ought to have united in a shorter period than those of the former; and, therefore, if no advantage were gained from allowing the patient to be up, we might have expected the cure to be at least equally speedy in the man confined to bed as in him who was permitted to leave it. Here, then, is a case which proves that when patients are confined to bed, the bones unite much more tardily than when they are allowed to move about, even when such means are made use of as are equally capable of fixing the parts, whether the patient be in bed or not.

I must here be allowed to remark that I do not mean to insinuate, by the above observation, that a man with a fracture of the leg may be permitted to leave his bed before the bones are united, when the limb is guarded by the usual means only; on the contrary, I believe that it is a practice which cannot be followed with impunity. When such means are resorted to as cannot be made to fix the fractured parts, we must of two evils choose the least, and cure the limb at the risk of weakening the constitution; but when the case is of such a nature that the patient may, without danger, be allowed to be about, it will hardly be denied that that practice which effects a cure most speedily, and at the same time saves the patient from confinement, must certainly be the best.

At the time my apparatus was first brought forward, it was considered by some surgeons, that the common splints could be made to confine the limb sufficiently to admit of a patient's leaving his bed without any danger of deformity or of non-union. It has come to my knowledge that this practice has been tried in several cases, one of which I will mention, as a caution to my brethren.

A healthy young man was struck upon the leg, with a force sufficiently powerful to break both bones. He had the common splints applied, and, *three weeks* after the accident, he was allowed to get up with them *closely* confined upon the limb. He was up for *twelve weeks*, cautiously walking about with the assistance of crutches, carrying the limb in a sling. He now came to St. Thomas's Hospital, as union had not taken place: the day after his admission into the hospital my apparatus was applied, and the man was desired to walk about, with the assistance of crutches, as much as he pleased, taking care to carry the limb in a sling. The apparatus was worn thirty-two days, and at the end of this time the bone was found united.

Here it will be observed, that one mode of practice was followed for twelve weeks, after three weeks confinement in bed, and failed to do what was accomplished by another in thirty-two days; and, therefore, I think we may fairly infer that the cause of non-union in this case is referable to the line of treatment which had been previously adopted.

Not only does the apparatus succeed in the manner above stated in common cases of fracture of the leg and thigh, but in cases where the contrivances usually resorted to have failed to produce union; in proof of which I may state the following case, which occurred in a person well known to fame.

I was called to Mr. Wallack, the actor, in consultation with sir A. Cooper and Mr. Tipple, of Mitcham, in consequence of his being confined with an un-united fracture of the leg. The fracture had existed seven months; during this time he had been treated in the manner usually advised. This gentleman had been under the care of some of the most eminent surgeons in America, Drs. Post, Kissam, and Physic, all of whom are well known in the surgical world, and I mention these names to show that Mr. W. had not been neglected.

Finding the various attempts made to unite the bone unattended by any beneficial result, he came to London for further surgical advice.

The apparatus was applied, and he was desired to take an airing every day, with the assistance of his crutches or in his gig. This he did, and also frequented the public places of amusement. The treatment here mentioned was persevered in for forty days, and at the end of this period the limb was found firmly united, and he is now following his usual avocations in London.*

The method by which this cure was accomplished, for all that I know, is new, and I trust will be found to supersede the painful and too often unsuccessful practice of sawing off the ends of the bone, of applying caustic to them, of introducing setons through the limb, &c.

I have now endeavoured to give the Society a general view of the utility of the apparatus in the treatment of recent simple fractures of the leg and thigh, and also in the treatment of those that have resisted the common means. It yet remains for me to show how far it is applicable in the treatment of compound fractures, and in the treatment of dislocations of the ancle and injuries of the knee.

By the term compound fracture, surgeons mean a solution of continuity in a bone, produced by violence, with a wound leading to the bone at the fractured part. This difference in the nature of the accident, trifling as it may seem, often sufficiently complicates the injury to make it strike at our existence. The untoward symptoms in these cases are greatly increased by the riding of the broken ends of the bone, the serrated edges of which prick and lacerate the surrounding textures, and produce pain, spasm, and inflammation in the limb, which too often go on to the death of the part and the destruction of the patient; and if the inflammation, by the help of a good constitution, should terminate in the formation of matter instead of in mortification, the matter not having a ready exit, burrows amongst the contiguous textures, producing abscess after abscess in distant parts of the limb, and often obliges the patient to submit to amputation in order to save himself from an untimely grave. These exasperated evils, in my humble opinion, ought more frequently to be attributed to the mode of treatment which the common plans oblige the surgeon to adopt, than to the nature of the injury which he has to treat. With them his hands are fettered; he sees but he cannot act. By the help of the apparatus which the Society have now an opportunity to examine, I may say, from experience, that the surgeon can make use of the most powerful means to prevent or subdue the dangerous symptoms—means which he does not dare employ without the assistance of some such contrivance.

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* I have treated six other cases upon the same plan, and all have proved successful.

I might bring forward various cases in proof of these assertions, but one will suffice for the purpose of illustration:—

Oct. 19th, 1822. As a woman, aged 39, was riding from London to Croydon, in a cart containing a load of about one ton weight, she fell from it upon the road, at a part which had been recently covered with flint stones. The wheel passed over the leg as it lay upon the stones, and produced a compound comminuted (broken into several pieces) fracture of both bones a little above the ancle joint. She had three wounds on the inner side of the limb, at the seat of fracture, which bled considerably. She was brought to St. Thomas's hospital in a litter, and on the 11th day after the accident my apparatus was employed. At this time the limb was bent, so as to form an angle projecting forward at the seat of fracture. At the expiration of forty days the apparatus was taken off, and the limb was now straight and firmly united.

During the time she wore the apparatus she had her bed made every second or third day, without pain or inconvenience, and without any sensation of motion in the fracture.

The observations which I have made upon the subject of compound fractures will also apply in the treatment of compound dislocations of the ancle. In these cases the apparatus keeps the foot and leg in a natural position; it keeps the injured parts steady and in proper opposition, without impeding the circulation. It thus favours a speedy union of the soft parts and of the fracture which always accompanies these accidents; and, if suppuration should occur, it allows of a ready exit to the matter. It admits of being altered, so that the limb may lie upon it as upon an inclined plane; it thus enables the surgeon to facilitate the return of the blood to the heart, and to lessen arterial action. It allows the careful surgeon to apply any kind of dressing to the wound, and to remove it at the proper periods, without producing the least motion in the situation of the injury or any alteration in the relative position of the limb. Thus the patient is saved from the pain which would be produced by any movement which may be accidentally or intentionally given to the limb when the wound is dressed, or at any other period, and all its injurious consequences. The patient may have aperients administered, so as to produce free action upon the bowels, as occasion may require; and he may have the limb moved or have his bed made, as often as may be necessary for his comfort, without producing pain or inconvenience, and without disturbing the injured parts.*

After what I have stated respecting the utility of the apparatus in the treatment of compound dislocations of the ancle, I need not say any thing respecting its advantages in the treatment of those which are simple.

In the treatment of injuries of the knee its utility consists in keeping the whole limb quiet, and in preventing the tender surfaces from rubbing upon each other, at the same time that it enables the surgeon to place the limb so as to favour the return of the blood to the heart and impede the action of the arteries.

I might have supported the utility of the apparatus, in the treatment of those accidents for which it was constructed, by the relation of various other cases under each particular head; but as I have been favoured with the concurring testimony of other individuals, further detail would be superfluous.

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* I address these observations to the Society at large, but as it is composed of members of various ranks and professions, I fear the beneficial results which must accrue to the patient, from the adoption of a plan which affords these advantages, can only be duly appreciated by the surgeon. The patient finds a difference between a mode of treatment which contributes so much to his comforts, to his ease, and to his safety, and that which confines him to his bed for weeks and months in one position, in all the filth which, notwithstanding the utmost care of the attendants, is necessarily generated by a large suppurating wound, as well as that which, by other circumstances is unavoidably produced; but the surgeon only can estimate how far the advantages I have mentioned tend to preserve the health of the constitution; he only can perceive how far they contribute to the speedy recovery of the subject of an accident of so formidable a nature.

CERTIFICATES.

Southampton Street, Bloomsbury,
SIR; London, April 24, 1823.

HAVING had experience of the great and superior advantages derived from your peculiar instrument for fractures, in the treatment of two cases of fracture of the leg, and one of the thigh, I am happy to give my testimony of its great utility in compound and even in simple fractures of the lower limbs; and should it be of any service to you, it will give pleasure to your humble servant,

T. FORSTER, *Senior Surgeon,*
Mr. Amesbury. *Guy's Hospital.*

March, 1823.

HAVING witnessed, in my practice at Guy's hospital, considerable advantage derived from the use of an instrument invented by Mr. Amesbury, for the cure of fractures of the lower limbs, I recommended its employment in a case of non-union of the large bone of the leg in Mrs. U. the lady of one of the most respectable of the country gentlemen of Suffolk, and in a similar example in Mr. Wallack, the actor, and with the happiest results. In the former case the bone had not united at the end of eight weeks, and in the latter, seven months had elapsed without union: both patients were cured without confinement, either from exercise or amusement, Mrs. U. in thirty-eight days and Mr. Wallack in forty.

This instrument seems particularly calculated for the cure of cases of non-union, as it admits of being adjusted so as to confine the fractured parts from motion whilst it presses the broken extremities of the bone firmly together, so as to excite ossific action.

ASTLEY COOPER,
Surgeon to Guy's Hospital.

14, Bloomsbury Square,
April 24, 1823.

SIR;

I HAVE great pleasure in affording my testimony in favour of your instrument for the treatment of fractures. Although I have casually had an opportunity of seeing the progress of some of those cases which have been treated with it in Guy's hospital, and as far as my observation has gone, have had great reason to think very favourably of the result; yet it is only in the case of Mrs. U. that, from frequent attendance during the whole cure, I am enabled to speak confidently. In the case of that lady, the union of the fractured tibia (large bone of the leg) not having taken place, the limb was rendered in a great degree useless, and her health was beginning to suffer from confinement. By the employment of your instrument, union was brought about without the usual restraints, and her health was much improved during the remainder of her cure, so that I had every reason to think very highly of the treatment adopted, and should certainly recommend it in any similar case.

I am, Sir,
&c. &c. &c.
RICHARD BRIGHT.

Mr. Amesbury.

22, Lincoln's Inn Fields,
Feb. 26th, 1823.

SIR;

I HAVE great pleasure in expressing my approbation of your apparatus for the treatment of fractures of the lower extremity. It has been successfully employed under my immediate inspection, at St. Thomas's Hospital, in one case of fracture through the middle of the thigh bone; in one case of simple fracture of the leg extending transversely through both bones; in one case of un united fracture of the leg; in three cases of compound fracture of the leg; and in one case of oblique fracture of the leg, which is still under my care. In all these cases the patients have appeared to derive great advantage from the use of the instrument.

The main purpose in the employment of mechanical contrivances in the treatment of fractures, seems to be that of preventing displacement of the broken extremities of the bone, both from the motions of the body, and from the actions of the muscles of the limb, under all the incidental varieties in fractures of situation, direction, and complication. This indication is, to the best of my judgment, more effectually and more easily fulfilled by your apparatus, and with greater comfort to the patient, than by any other contrivance with which I am acquainted.

I am, Sir,
&c. &c. &c.
JOSEPH HENRY GREEN, *Surgeon to*
St. Thomas's Hospital.

Mr. Amesbury.

Mr. Green not being able to attend the committee, the evening the apparatus was under examination, politely forwarded to me the following communication.

22, Lincoln's Inn Fields,
May 8th, 1823.

SIR;

I REGRET that I shall not be able to attend the Society of Arts this evening. I should have been most happy otherwise to give my testimony, personally, to the various advantages gained by using your apparatus in the treatment of fractures of the lower extremities. Indeed I know of no other contrivance, which has, even for its object, the accomplishment of so many important indications in the treatment of those injuries.

From what I have observed, I may state, that your apparatus fixes the fractured parts with more security than other instruments, in consequence of its preventing motion in the joints influencing the fracture. It allows of alteration in the position of the extremity, a circumstance so necessary under the varying states of these accidents that it is the condition of success in many cases; and it may be placed so as to ensure extension of the leg or thigh, whether the limb be bent or straight, if the case should require it. When used in the treatment of fractures of the thigh below the upper third, or in the treatment of compound fracture of the leg, it permits the patient to evacuate his bowels; and to be moved from his bed, in order to have it made, and, in most cases of simple fracture of the leg, to sit up or walk, with the assistance of crutches, before the bones are united, without the least danger of displacing the fractured extremities; and it admits of being placed upon the limb so as to press the broken ends together when the union is tardy. The instrument is easily adjusted; it may be used in any situation, as it requires no auxiliary means or contrivances and is light and portable; and its mechanism is free from any unnecessary complication. In fact, from the experience which I have had, it appears to me a most valuable aid in our treatment of fractures of the lower extremities, and, as far as I know, original with yourself, at least I do not know of any contrivance which is like it in principle or in mechanism.

I am, Sir,
&c. &c. &c.
JOSEPH HENRY GREEN, *Surgeon to*
Mr. Amesbury. *St. Thomas's Hospital.*

P. S. In reply to your question whether it would be safe for a patient to be moved out of bed with the ordinary splints, or box, I can only say, that I do not think that they are a secure support even in bed; and that, with a cough or in using a bed-pan, I have known patients complain of motion and pain in the fractured part.

J. H. G.

Guy's Hospital,
SIR; Thursday, March 27, 1823.

In answer to your note requesting my opinion of your instrument for fractures of the leg and thigh, I can state with great pleasure my full conviction of its utility.

I have seen three cases of simple fracture of the leg treated with it in Guy's Hospital. One a man about 55 years of age, with a fracture of both bones, on whom the apparatus was applied the second day after the accident: a second was a female aged about 45, with tibia and fibula broken just above the ancle joint, in which case the instrument was not applied till the 14th day; a third, was in a woman, aged 42, with a severe contusion of the ancle, and fracture of both bones, just above the ancle joint. In this case the instrument was applied on the third day. These patients were allowed to get up in three days after the instrument was applied, and the bones were found firmly united in the usual period; and they left the hospital without any deformity in their limbs.

In a case of fractured thigh, extending through the upper third, now convalescent in Cornelius ward, I have seen the instrument used with great benefit and comfort to the patient. The instrument was applied 31 days; and during that time the limb could be freely moved, without displacing the bones or producing pain.

I yesterday saw a patient walking in the square of our hospital, with both bones of the leg broken; and partially dislocated outward, off their articular surfaces. This patient had the instrument applied on the day of the accident, which was only a fortnight ago.

These facts speak more strongly in favour of your invention than any general opinion I could give. Its real merits when known, cannot fail to procure it a favourable and highly-welcome reception among the profession.

I am, Sir,
&c. &c. &c.
C. ASTON KEY, *Assistant-Surgeon,*
Guy's Hospital.

Mr. Amesbury.

Doctor Alleyne not being able to attend, forwarded the following communication to the Society.

26, Dean-street,
May 8th, 1823.

SIR;

HAVING been honoured with a letter from the Society of Arts, inviting my opinion respecting an apparatus for fractured limbs, submitted to it by Mr. Amesbury, I cannot forego expressing my regret at the impossibility of my attending the Committee this evening, in consequence of a particular engagement at a distant quarter of the town. This alone, I assure you, prevents my coming forward as an advocate for this very valuable and novel instrument. I have seen many contrivances for fractured limbs, both in this and other countries, and without the shadow of doubt, I do believe the one now before the committee to embrace more points of utility than any other hitherto introduced.

Having observed the insufficiency of the common means, as applied to fractures in warm climates, I am enabled confidently to expect the most favourable results to this branch of surgery, by the adoption of Mr. Amesbury's plan; and, on my return to the West Indies, it shall be my care to introduce it as widely as possible,

I am, Sir,
&c. &c. &c.
JAMES H. ALLEYNE.

To A. Aikin, Esq.
Secretary, &c. &c.

The following was received from Doctor Russell, as he was not able to attend the committee in consequence of illness.

SIR; Dean-street, May 8th, 1823.

I SHOULD have had much gratification, in complying with the desire of the Committee of the Society of Arts, intimated to me in your letter; but am prevented from doing so by indisposition.

Allow me to state, that it is my decided opinion, speaking from ocular demonstration of its efficacy, that Mr. Amesbury's apparatus is better calculated to answer its intended purposes, than any other which I have hitherto seen used with the view of curing fractures. When it is applied, patients say that they feel a degree of ease and general comfort, which they could scarcely have anticipated to be compatible with the character of their accident. This apparatus admits of motion to the patient and to the limb, in all cases of fracture below the upper third of the thigh. In cases of simple fracture of the leg, the patient may not only turn in bed as he pleases, when this apparatus is used, but he may, with common care, go out of the house before the bones are united, without the slightest apprehension of any unpleasant consequence. The advantages which have been already, perhaps, stated to result from this principle cannot fail to make some impression on reflecting minds. The judicious application of means capable of giving such advantages must beyond all doubt contribute materially to the favourable issue of every case. One fact which strikingly illustrates the utility of this apparatus is its application in cases of disunited* fractures. It sometimes happens, that in consequence of debility, either hereditary or acquired, the fractured ends of bones do not unite. This apparatus keeps the parts so quiet, so compact, and in such close apposition, that by the exercise which the patient is permitted to take, he acquires health, ossific inflammation is set up; and union is perfected.

I am, Sir,
&c. &c. &c.
To A. Aikin, Esq.
Secretary, &c. &c.
JAMES RUSSELL.

From what has been said I hope the Society will be able to form some notion of the beneficial effects which accrue to the profession and the public, from the judicious application of my humble contrivance. I am far from supposing that the apparatus may not be improved, but I have now brought it to a degree of perfection which, I trust, will be found to bear inspection. The success with which its application has been attended enables me to recommend it confidently to my professional brethren; and I would say to them,

If not the first by whom the new are tried,
Be not the last that lay the old aside.

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[*] A term applied to fractures of long standing.

Reference to the Engraving.

Plate XI.—(The same letters refer to the same parts in each figure.) Fig. 1 is a side or edge view of the apparatus, without the straps that secure it to the limbs. The leg-piece C, thigh-piece A, foot-board P, and wooden sole H, should be made of light strong wood.

Fig. 2 is a front view, with the thigh-piece A represented perpendicular.

Fig. 3 is a view of the back part of the thigh-piece A, together with the straps *a a a*, which secure it to the thigh (one end of the straps is represented as broken off, but they ought to be of sufficient length to go round the thigh), and also the pelvis-strap *b b*, with its sliding-pad *c c*.

Fig. 3*a* is an edge or side, and

Fig. 4, a front view of the thigh-piece A without the straps.

The front of the thigh-piece A is made hollow to fit the under part of the thigh, and the upper end of the back part is made cylindrical, and the lower end flat. See fig. 5, which is a cross section at the dotted line *d d*, fig. 3; and fig. 6 is a section at the dotted line *f f*, fig. 3. To the upper end of the thigh-piece A is fixed a brass plate B, by means of two screws *g g*, which pass through two holes in the plate B, and through two longitudinal grooves in the thigh-piece A, and also through two holes in the steel plates *h h*, which are opposite to those in the brass plate B, and are fixed by the thumb-screws or nuts, *g g*, in any required situation; consequently the length of the thigh-piece A may be adjusted by means of the screws sliding along the grooves. The front side of the brass plate B is also made hollow to fit the back part of the thigh.

Fig. 7 is a view of the lower end or edge of the plate B.

To the upper end, and on the back part of the plate B are fixed the two steel plates *h h*.

Fig. 8 is a view of the back part of the brass plate B, and of the steel plates *h h*, and fig. 9 is an edge or side view of the same; they are knee'd or bent to receive between them the thigh-piece A, the pelvis-strap *b b*, and the brass-plate B.

To the back part of the thigh-piece A is fixed a brass rack or plate *i i*, fig. 3, with six projecting pieces, *j j*, and one on the back part of it which receive a brass foot, or transferable joint-piece *k*.

The lower end of the thigh-piece A is connected to the upper end of the leg-piece C, by means of a hinge joint, *l*. (See figs. 1 and 2.) The axis of the joint *l*, which is fixed to the lower part of the thigh-piece A is oblique to a line down the middle of the thigh-piece. By referring to fig. 1, it will be seen that the thigh-piece A is not in a direct line with that of the leg-piece C, but is inclined towards the left hand. This thigh-piece A is adapted to the left thigh. By referring to fig. 4 it will be seen that the bottom of the thigh-piece A, to which the joint *l* is fixed, is oblique in the contrary direction to that of figs. 2 and 3, and when connected to the joint of the leg-piece C by the pin *m*, it will be inclined in a proper direction for the right thigh and leg. Two of these pieces, one for the right and the other for the left thigh are adapted to one set of apparatus. The front of the leg-piece C is made hollow so as to fit the back part of the leg.

Fig. 10 is a view of the upper end of the leg-piece C, its hinge, and one of its straps, *n*, &c.

Fig. 11 is a cross section (at the dotted line *o*, fig. 13) of the leg-piece C, and also one of its straps *n*, which are fixed to it by a brass stud *p*.

Fig. 12 is a view of the lower end of the leg-piece C. The dotted line at *q*, fig. 1, represents the thickness of the middle of the back part of the leg-piece. From the upper end, to *r*, the back part of the leg-piece is cylindrical, and from *r* to the lower end, it is flat (see fig. 13). To the back part of the leg-piece C, are screwed four brass studs, *p p p p*, which pass through the straps *n n*, and retain them in their proper places. The straps are for securing the leg-piece C to the leg.

To the back part of the leg-piece C is fixed a piece of brass S, to which the lower end of a steel rod *t*, is connected by a hinge joint. The upper end of the steel rod *t*, is also connected by a hinge joint *u*, to the foot or transferable joint piece *k* (see figs. 14 and 15, which are a back and edge view of the brass foot or tranferable joint piece, rod and spring bolt connected; and drawn to a scale double the size of that of the rest of the figures). The foot *k* is made with a gap in each end, and a hole *v* in the middle, which receives one projecting tooth, while the gaps receive portions of two others. The teeth *j j*, are arranged upon a rack *i*, and are all equally distant, and similar to each other; so that the brass foot *k*, may be applied to any of them, and secured by a spring bolt *w*, which passes through a hole in the side of the foot *k*, and also through a hole in the tooth *j*, which is in the hole *v*, in the middle of the foot *k*. The spring bolt *w*, is made something similar to the key of a flute, and is fixed by a joint to the side of the foot *k*, so that when the end *x* of the key is depressed, it withdraws the bolt *w*, which is connected to the other end of it by a joint, but when the end *x* of the key is not depressed, a spring which is fixed to the under side, raises the end *x*, and thrusts home the bolt *w*. When the hole *v* in the foot-piece *k*, is applied to the lowest tooth *j*, of the rack *i*, the steel rod *t* directs and retains the thigh-piece A, perpendicular or straight with the leg-piece C; but when the foot-piece *k* is applied to the highest tooth *j* of the rack *i*, the thigh-piece A will be bent to a right angle with the leg-piece C, consequently the thigh-piece may be fixed at six different angles, as circumstances may require.

P, fig. 13, refers to the foot-board which clips the lower part of the leg-piece C, and is retained by a pin *y*, which passes through a hole in the end of the foot-board where it clips the leg-piece; and also through the leg-piece C. In the lower part of the leg-piece are made a number of holes, so that the height of the foot-board P, may be accommodated to legs of different lengths. The toe end of the foot-board P, must not be admitted to rise more than to form a right angle with the leg-piece C; but it may be admitted to turn below that angle. The foot-board is supported by a strap *z*, one end of which receives a brass eye or hook E, which is fixed to one edge of the bottom part of the thigh-piece A; the other end of the strap *z* is passed beneath the foot-board, and brought up by the side of the leg, and buckled to another strap which also receives a brass eye or hook F, on the opposite edge of the thigh-piece, fig. 2. By this contrivance the strap may be connected with either thigh-piece, and may also be accommodated to the length of the leg. To the under side of the foot-board is nailed a piece of leather G, fig. 16, which passes beneath the strap *z*, and prevents it from sliding too near the heel or toe of the foot-board. See fig. 16, which is a view of the underside of the foot-board P.

Fig. 17 is an edge or side view of the foot-board P, and of the wooden sole H to which the shoe K (fig. 1), is nailed.

Fig. 18 is a view of the underside of the wooden sole H. On the underside of the sole H, is made a recess to receive a strap I; one end of this strap is nailed to the sole; the other passes over a gap in the end of the foot-board, and is buckled to a strap J, fig. 16, one end of which is nailed to the under side of the foot-board. The use of the strap I, is to regulate the elevation of the shoe upon the foot-board as circumstances may require. On the upper side of the wooden sole H, is fixed a buckle and strap L L, which passes over the sides of the foot-board, and is buckled beneath it. The use of this strap is to prevent the shoe from slipping off to either side of the foot-board, and to regulate the extension of the limb when necessary. The shoe K is made of sheep skin or soft leather, and opens from heel to toe, so that the foot may be placed in it, without twisting in any direction; the upper leather of the shoe K is made to fold over the upper part of the foot, and is tied with three ribbons. A small leather strap is stitched to each side of the heel of the shoe, and is brought over the instep and buckled. In fig. 1 is represented a side view, and in fig. 2, a front view of the shoe.

Fig. 19 is a view of the outside of a splint, which is to be applied to the outside of the left leg.

Fig. 20 is a back or edge view, and

Fig. 21 a longitudinal section of the same.

The dotted segments in fig. 19, represent cross sections, or the thickness of the splint at their respective places. M M is a piece of leather fixed to the splint at both ends and at the middle, for the straps to pass under.

The inside of the splint is made hollow to fit the outside of the leg and ancle, and the outside of the splint is made cylindrical or is reduced to a proper strength (See the sections at the dotted lines).

Fig. 22 is a view of the outside of a splint that is to be applied to the inside of the left leg.

Fig. 23 is a front or edge view, and

Fig. 24 is a longitudinal section of the same.

The dotted segments in Fig. 22, represent cross sections on the thickness of the splint at their respective places, the inside is made hollow to fit the inner side of the leg, and is reduced on the outside to a proper strength.

Fig. 25 is a view of the outside of a splint that is to be applied to the front of the leg, and

Fig. 26 is an edge view of the same, showing the manner it is bent. This splint consists of four thin pieces of light wood, one of which is equal in width to the other three. The inner side of the splint has a piece of thin leather glued over it, and the outer side has two pieces of leather N N stitched across it; so that the inner side of the splint may be bent to fit the front of the leg. It has a long narrow piece of leather O stitched at four places to the outside, for the straps to pass under.

Fig. 27 is a view of the outside of a splint that is to be applied to the outside of the thigh, and

Fig. 28 is an edge view of the same.

Fig. 29 is a view of the outside of a splint that is to be applied to the front part of the thigh.

Fig. 30 is an edge view of the same.

Fig. 31 is a view of the outside of a splint that is to be applied to the inner side of the thigh, and

Fig. 32 is an edge view of the same.

The dotted segments shown in figures 27, 29, and 31, represent cross sections, or the sections of, the splint at their respective places; each of these splints has a strip of leather stitched upon it for straps to pass under, similar to those already described. The splints are best made of light deal.

The splints represented in figures 19, 22, and 25, are used, with the apparatus, in the treatment of fractures of the leg; and those which are represented, in figures 27, 29, and 31, are employed, with the apparatus, in the treatment of fractures of the thigh.

The brass plate, represented in fig. 8, is used when the apparatus is employed in the treatment of fractures of the thigh, compound fractures of the leg, compound dislocations of the ancle, and injuries of the knee; but is not required in the treatment of simple fractures of the leg, or in simple dislocations of the ancle.

The pelvis strap, seen in fig. 3, *b b*, with its sliding pad *c c*, is employed in the treatment of all those cases which require the use of the sliding brass plate (fig. 8), and serves to connect the apparatus to the pelvis.

The surgeon having padded the apparatus, regulates its application; and also the application of the short splints, according to the situation and nature of the injury.

N° VI.

CAP FOR FRACTURED OR DISLOCATED PATELLA.

The SILVER VULCAN MEDAL *and* TEN GUINEAS *were this Session presented to Mr.* W. RAYNES, *of Regent Street, Westminster, for his* CAP FOR FRACTURED OR DISLOCATED PATELLA, *which has been placed in the Society's Repository.*

WHEN the patella is broken across, the fractured portions recede, in consequence of the contractile action of the powerful ligaments to which this bone is attached. The intention of one of Mr. Raynes's instruments is to counteract this tendency to recede, and, by keeping the broken surfaces in apposition, to facilitate and expedite their union.

The other instrument invented by Mr. Raynes is for giving relief in cases of dislocated patella.

The Society are well aware that instruments of the above description would come before the public with higher claims to notice under the sanction of strictly professional recommendation. The reward which they bestowed on the ingenious artist was, however, given with the concurrence of several surgeons who stand high in public estimation, and they trust that the instruments will be found of use to those who may have occasion to make trial of them.

Reference to the Engraving of Mr. WILLIAM RAYNES'S *Instruments, or Spring Bandages, for dislocated and fractured Patella.*

Plate XII.—Fig. 1 is an outside view of the right knee, with a double-spring bandage applied to it, in a case of fractured patella.

Fig. 2 is a view of the outside of the bandage represented as stretched out.

Fig. 3 is a similar view to fig. 2 of the side plate, springs, &c. without the bandages or padding.

Fig. 4 is a similar view to fig. 1 of the steel side plate, springs, &c. without the bandages.

The same letters refer to the same parts in each figure.

Fig. 5 is a front view of the knee, together with the side plates *a* and *b*, showing the manner in which they are bent, to fit the sides of the knee before the bandages are fixed to them.

The upper and lower side plates, *a* and *b*, are fixed together by a joint, and are at liberty to turn in the direction of the knee 90°; the lower, or joint ends of the upper side plates have two circular grooves *c c*, 90° each, to the hole in the centre of the joint, as shown in fig. 6.

The upper ends of the side plates are connected together by a thin spring *d* (bent so as to fit the back part of the thigh), the upper edge of which is shown in fig. 7.

Fig. 8 is a front or edge view of the upper side plates *a a*, together with the springs *e e*, which are fixed by two screws to the outer side of the side plates—see figs. 3 and 4.

To the upper, or joint, ends of the lower side plates *b b*, are fixed two studs *f f* and *g g* (see figs. 9 and 10, which are a side and edge view), which act in the grooves *c c*, in the joints of the upper side plates *a a*; and also limit the extent of the action of the joint. The lower ends of the side plates *b b* are connected together by a thin spring *h*, which is bent so as to fit and clip one half of the back part of the leg, see fig. 11, which is a view of the under edge of the spring *h*.

To the inner sides of the joints of the side plates are fixed the ends of another thin spring *i*, bent so as to fit the ham (see figs. 12 and 13, which are an edge and side view); its ends are connected to the side plates by means of the joint or centre pins, which pass also through the upper and lower side plates, and are secured on each side. The upper and lower side plates, and also the spring or ham plate *i*, are at liberty to turn on the joint pins, independently of each other. The centres of the joints of the side plates must be placed so as to coincide with the centre of motion of the knee.

The elevating springs *e e*, which are fixed to the upper side plates, act on the studs *g g* (which project also on the outside of the joint of the lower side plate), and tend to assist the muscles in straightening the knee.

The bent springs *d*, *i*, and *h*, which clip the back part of the thigh, &c. are covered with thin leather, and firmly sewed to their respective bandages (see figs. 1 and 2); the insides of the bandages are made of soft doe, or sheep, leather, and the external sides may be covered with morocco leather, jane, or canvas, as required; to the ends of the bandages are stitched buckles and straps, as being the most convenient mode of adjusting, or of doing and undoing. The bandages may be secured by lacing, but in that case more time will be required.

To the outside of the middle bandage, and at the end *j*, is stitched a piece of leather, with a hole in the middle to receive the patella, or cap of the knee (it also forms the ends of the straps); the internal part of the bandage under the hole at *j* is made concave, to receive the patella of the knee; *k k* are two elastic springs, which consist each of two helical springs inclosed in a piece of thin kid leather, the leather is of sufficient length to receive the spring when extended, but when the spring is contracted the leather is contracted also; the lower ends of the springs are stitched fast to the outside of the middle bandage at *j*, and the upper ends are made fast to a small pad, the shape of which is represented by a dotted line at *l*; the pad is fixed to the under side of the upper bandage by means of a narrow piece of soft leather (as represented by the dotted lines at *m*) which passes beneath the springs and is firmly stitched to the under side of the bandage. The use of the springs *k k* is to prevent the upper part of the fractured patella from slipping up out of its place when the knee is bent.

Fig. 14, is an inside view of the left knee, with a single-spring bandage applied to it, as in a case of dislocated patella.

Fig. 15 is an outside view of the bandage, &c. represented as stretched out. This instrument differs but little in principle, but is more simple than the one already described.

Only one set of side plates, or elevating springs is used, the spring *n*, which is fixed to the upper side plate, projects each way, and is bent so as to fit the side of the thigh.

Fig. 16 is a side view.

Fig. 17 a front or edge view, and

Fig. 18 a view of the upper edge of the spring *n*, which clips the side of the thigh. The spring at the bottom part of the lower side plate is bent so as to clip the side of the leg.

Fig. 19 is a side view.

Fig. 20 a front, or edge view, and

Fig. 21 a view of the upper edge of the spring *o*, which clips the inside of the leg; the joint and elevating spring *e* is similar to the one above described.

Fig. 22 is a side, and

Fig. 23 an edge view of the elevating spring *e;* no spring is applied to the side plates to go beneath the ham, as in the former instrument; but there is a spring plate *p*, one end of which is fixed to the inside of the joint of the side plates, and is at liberty to turn either way, independent of the side plates; the other end of the spring is made broad, and has a hole *q*, to receive the patella; the spring *p* is bent from the joint of the side plates over the top of the patella, and is made concave so as to rest easy upon the knee.

Fig. 24 is a view of the upper edge, and

Fig. 25 is a side view of the spring *p;* there is a number of small holes made round each end of it to secure it to the bandage. The bandages are fitted up in a similar way to the former instrument. When the instrument is properly fitted and adjusted to the knee, the action of the spring *p* prevents the patella from sliding out of its place.

N° VII.

KILN FOR DRYING CORN.

The LARGE GOLD MEDAL *was this Session presented to Mr.* JAMES JONES, *of Holborn, for a* VERTICAL KILN FOR DRYING CORN. *The following Communication has been received from him on the Subject, and a Model of the Apparatus is placed in the Society's Repository.*

150, High Holborn,
April 18, 1823.

SIR;

I SHALL feel much obliged if you avail yourself of the first convenient opportunity of submitting the accompanying drawing and description of a new kiln, for the purpose of drying corn, pulse, &c. to the consideration of the Society of Arts.

I am, Sir,
&c. &c. &c.
JAMES JONES.

Perhaps no subjects which can be brought under the consideration of a society of intelligent men, whose object is the welfare of the community at large, combine so much real interest and importance as those which involve the production and preservation of the chief necessaries of human life; and in this view I believe the great value of a speedy and effectual method of drying grain is too evident to require impressing on the minds of those, particularly, who are in the least acquainted with the business of the farmer, the corn-factor, or the miller. The frequent occurrence of crops being, on account of unfavourable weather, necessarily carried from the field in a state of considerable humidity, every one must be aware of; and the consequent reduction in the value of the produce, arising from the deterioration in its quality, cannot be less evident. The heat generated by the fermentation in the heap, together with the moisture, causes germination to take place in the grains near the surface, whereby the farina is decomposed, and the nutritive properties are in a great measure destroyed, whilst the lower part becomes mouldy and acquires a musty smell, of the most foul and disgusting kind; but grain laid up in a perfectly dry state suffers no change, and history furnishes numerous instances of the discovery of ancient granaries, wherein the corn has been preserved in the most perfect condition for a long series of years; which, if it had been stored in a state of dampness, would have inevitably been destroyed. This, in the time of wet harvests, renders essentially necessary some artificial means of speedily dissipating the moisture, which is so destructive if allowed to continue in the grain, and the only means of effecting this object is by the use of the common kilns; but which, in very bad seasons, on account of the slowness of their operation, are not sufficiently numerous to answer the purpose to the extent required, and the government find it requisite to permit the drying of grain on the malt-kilns. As an appendage to large granaries, or corn-stores, kilns are of infinite utility, both as affording the certain means of preserving the grain from any tendency to fermentation whilst lying in store, and fitting it for water-carriage by that degree of dryness which is absolutely necessary to prevent its heating on board, where the opportunities of turning it are so limited, if not altogether wanting, although the necessity of it is increased; and to the miller the use of a kiln is not less important, as without a certain degree of dryness the wheat will not grind freely, it clogs the stones, and good flour is not produced; and I believe it is a very general practice with millers who possess the means, to pass all wheat over the kiln when the flour is intended for water-carriage; at least I know it is the custom at some mills, and indeed it is perfectly well known that new flour, particularly of the finest quality, when in a damp state, has a remarkable pre-disposition to encourage the propagation of those minute insects which are so totally destructive of its good properties.

The common kiln is so well known that little need be said in the way of description, except to enable those who are unacquainted with its construction to judge of the comparative merits of the old kiln and the one hereafter described: suffice it to say, that it consists of a floor usually composed of Bridgewater tiles, which are large square flat tiles perforated with a great number of small holes; or otherways, of iron plates perforated in the same way; or of wove wire-work, either kind being supported on iron bearing-bars extending from wall to wall. Beneath this floor, or kiln head, as it is frequently called, are built four portions of arches of brick work, which together compose a form somewhat similar to an inverted frustum of a pyramid, whose larger base is equal to the area of the floor; and in the lesser base, which is supported on low walls, is placed, at the distance of five or six feet from the tiles, a fire, composed of coke, culm, or other suitable fuel, the heated air and vapour from which ascends into the pyramidal space above it, spreading rather unequally over the inferior surface of the floor, passing through the perforations made in it, and through the interstices between the grain, which is spread in considerable thickness upon it; the lower part of the stratum thus necessarily gets considerably heated, and the humidity is evaporated. After a lapse of time, dependent on the state of the grain, it is turned over with a large wooden shovel, or scoop, for the purpose of removing those grains which were before at the top, nearer to the heated surface, and those which are sufficiently dried to the top, and is then suffered to remain until it is fit to be turned again, if from its previous damp state that is necessary, or to be removed entirely from the kiln, when a fresh quantity is submitted to the same operation. The length of time it lies on the kiln depends on the proportion of moisture contained in the grain, and varies from five to eight or nine hours, indeed Mr. Tull states the occasional necessity of it to extend as far as twelve hours. On the kilns used previously to the one I erected, the average time required for the purpose was seven hours and a half, during which time four quarters and a half were dried, being at the rate of fourteen quarters and a half per day.

The imperfections of this method are so glaring, that it must excite surprise that no effectual means have been devised to obviate them: for I believe the only alterations either effected or proposed, have been in the manner of heating, whereby the grain might imbibe less of the unpleasant flavour derived from the fuel; with only one exception that I am acquainted with, which is at a mill in Wapping, where the wheat is constantly turned over by the action of a traversing and revolving rake, similar, I believe, to that for which Mr. Barchard was rewarded by the Society.

It must be evident that a stratum of wheat several inches thick, cannot be equally heated through all its parts in a short time, and, consequently, that the moisture which is expelled from the grains nearest the tiles, by the first effect of the fire, in the form of steam, must, in its ascent, be condensed and deposited on the colder grains which are nearer to or at the surface; and, consequently, so far as regards the upper part of the stratum, the evil is doubled, and until the grain is turned over (unless that operation is excessively delayed), the upper portion does not part with any of its previous or acquired moisture, and when it is turned, it must be allowed to remain long enough to evaporate perhaps twice its original quantity of humidity, during which time the part which was first dried re-absorbs much of the moisture exhaled from the other grains, by which the time requisite to expel the whole is greatly extended; and in this view I am confirmed by the very short time which proves sufficient in the mode I have adopted. Whether any, or what chemical action takes place, detrimental to the flour in this protracted state of humid heat, I am not prepared to state, but I think it will not be doubted that the least possible time in which the purpose can be effected, the less chance there is of injurious change; and I also think it will be admitted that in those kilns which are heated by the direct action of the fire, the longer the grain remains, the more it will imbibe of the unpleasant effluvium arising from the fuel; but in kilns where the drying is performed by heated air alone, this objection does not exist. The operation of turning must obviously be an imperfect and inefficient one, notwithstanding every attention may be paid by the man performing it, for it is impossible he can turn the whole completely; but, from the circumstance of its being an unpleasant operation, it is seldom performed as effectually as it perhaps might be; but let the care and attention employed be unlimited, still, from the inequalities of the surface on which the grain lies, it is utterly impossible that the turning can be so complete but that some of the grains remain undisturbed, and much is necessarily again brought into contact with the tiles, and therefore becomes over-dried, to the injury of the entire quantity; and, in fact, the experience of every day shows the inequality of this mode of drying, as frequently, if not always, some of the grains are quite parched, whereby the quality of the flour is much injured, while others are thrown off the kiln almost as damp as when laid on.

That the imperfections here stated attach to the use of the common kiln, every person acquainted with the subject will, I believe, acknowledge, and to such persons the communication of an effectual remedy will not be unacceptable.

In the latter part of the year 1821 I was applied to by John Snook, esq. the proprietor of large mills at Bedhampton, Hants, to endeavour to effect some improvement in his kilns, so as, if possible, to obviate the existing objections, and although I acknowledge that at that time I was perfectly unacquainted with the subject, very little reflection sufficed to convince me that the principles of the old method were bad; and I, therefore, instead of attempting any alteration in the old kilns, after a good deal of consideration, proposed the adoption of one altogether new, both in construction and the manner of its operation, which I hoped would possess in an eminent degree those properties which are essential to a perfect mode of drying, and which requisites I conceive to be, the exposure of a very thin stratum of grain, an equal temperature, the passage of a very large quantity of warm air, and an uninterrupted removal or turning; each of which are indispensable where perfection is sought. This proposition was approved, and in June last year it was set to work, and the first trial sufficiently proved the superiority of the new method over the old one, for the work it did compared with one of the old kilns, which was at work a few days before, and with the same wheat, was rather more than as six to one. This, indeed, far exceeded the effect my most sanguine anticipations had suggested, and amply confirmed my previous opinion of the old kilns. Thus sanctioned by the test of experience, I submit it to the consideration of the Society of Arts, feeling conscious that the importance of the subject will be thought sufficient apology for this communication, particularly as it has some analogy to the ultimate object of the premium, No. 34, "For harvesting Corn in Wet Weather."

The drawings explanatory of the machine are,

Plate XIII, fig. 1, an elevation.

Fig. 2, a vertical section through the line *a b*.

Fig. 3, a horizontal section through the line *c d*, and

Fig. 4, a vertical section of the fire-place, on the line *e f*. The same letters indicate the same parts in each figure. The body of the kiln is composed of two concentric cylinders A A and B B, closed at top and at bottom by two concentric cones C C and D D; the external cylinder, and the bases of its two cones, are 6 feet 2½ inches diameter, and 8 feet high; the internal cylinder and its two cones are 6 feet diameter and 7 feet 10 inches high; leaving an annular space, one inch and a quarter wide, between the internal and external bodies, which are perforated iron plates, having 2,300 small holes in each square foot. The kiln is supported on five cast-iron columns E E E E E, 6 feet 6 inches high, which are attached at their tops to a strong iron ring which surrounds the base of the cylinder. From the heads of these columns descend along the sides of the cone five long bolts G G G G G, which are passed through the same number of lugs in the cast-iron ring H, which surrounds the neck of the lower cone; from the same ring H also proceed five stays I I I I I, which are fastened through the middle of the columns, by a nut on each side. The columns were made of the height here stated for the purpose of enabling the wheat to be received into sacks, that being the most convenient under the particular circumstances; but in a mill where an elevator is near at hand, or where it would not be inconvenient to allow the wheat to run on the floor, the whole kiln might be brought lower down, and I would always recommend as great a length of cylinder as the height of the granary floor will admit of, as by the grain having a greater distance to descend, the motion would be more rapid, and, consequently, the turning will be more complete. The body is sustained both internally and externally by iron hoops K K K, and the distance between the cylinders is preserved by a number of short stays. When the kiln is in operation the annular space before spoken of is entirely filled with wheat, by means of the spout W, from the granary, which keeps up a constant supply as fast as its exit is allowed at the discharging spout X, the opening of which is governed by a regulator, being adjusted to the time requisite to evaporate the moisture.

In the front of the kiln is cut out a space L M N O P, in which is fixed the fire-place L M O P, in which Q is the fire hole, and R R are openings with doors, for the purpose of cleaning the flues; S is the ash-hole and T the fire bars. On reference to the sections, it will be seen that there are vertical air-passages round which the flame and heat of the fuel circulates to the right and left, until it reaches the chimney, which rises through nearly the centre of the kiln; the course of the flame is evident, by the direction of the arrows, and in its passage to the chimney it very powerfully heats the plates which form the sides of the air-passages, and occasions a constant rush of hot air through them into the body of the kiln. The whole of the fire-place being enclosed within the kiln, it is entirely surrounded (excepting in the front) by a thin shell or casing of grain, and from its perfectly insulated situation, no part of its heat can escape, without having first performed its destined office. The triangular space or opening immediately over the fire-place answers two purposes, the chief of which is, diverting the wheat as it descends, from coming too near the fire, whereby it would be parched; and it affords a convenient entrance into the kiln when requisite. It was at first intended to use a plain open fire-place, with coke or culm, when a chimney would have been unnecessary, and all the heat would be available, which with a chimney is not possible, as of course some heat escapes that way; but it was thought desirable to have a close fire-place which would produce the required effect with any ordinary fuel, merely by the radiant heat of the iron plates and a current of hot air, without subjecting the wheat to the effluvia arising from the fuel; and I accordingly made it in the way here shown. The front part of the fire-place is supported on the heads of the two front columns, and the hinder part within the kiln by the pillar *g*, the top of which is fixed in a socket in a bearing-bar across the bottom of the fire-place, and the lower end stands in a cup in the intersection of an iron cross, which rests in the ring H, before-mentioned, and the weight of the fire-place (nearly 15 cwt.) is consequently sustained by the bolts G G which descend from the heads of all the columns. This weight might perhaps have been reduced, but I would rather make it heavier than lighter; feeling satisfied that the drying must be the more regular, the greater the weight of metal in the fire-place; as from any inattention in the care of the fire, the temperature of the whole mass would be less suddenly affected, either by excess or defect of firing.*

From this description, together with the drawing, the construction will be easily understood; and few words will be requisite to explain its operation. The fire having been lighted, the wheat is admitted from the granary, the regulator at bottom being for a few minutes kept shut; when the annular space being full, the only way the warm air contained in the upper part of the kiln can escape, is through the holes in the iron and the interstices between the grains; and as the stratum or shell of wheat is so thin, the passage of air is very rapid, and consequently the moisture is taken up by it, and carried off with the utmost celerity. With regard to the motion or stirring it undergoes, a few words may be requisite. It is obvious that the apex of the cone (where the wheat enters) must have the greatest heat; here it is in a state of constant diverging motion, rapid where the heat is greatest, and progressively slower as the temperature diminishes, until it reaches the cylinders, where the motion becomes equable; here the wheat would perhaps descend bodily (particularly if the kiln was made of wove-wire, as at first intended), but the roughness left by the punching of the holes in the iron-plate, is highly useful, as the little resistance it offers to the grain sliding down, produces a constant, slow, rolling, intestine motion, whereby every individual grain is exposed to the same degree of temperature; it then again converges in the lower cone, producing the same turning and mixing motion, as in the upper cone, and ultimately escapes through the spout at the bottom, either into sacks, or on the ground as may be desired. It will be perceived that evaporation is at first strongly excited by as considerable a degree of heat as the purpose will safely admit of, which evaporation is then gently kept up by a progressively decreasing temperature, as the grain descends towards the discharging spout; and it will be obvious that the grain need not be subjected to the same degree of heat during the whole time it is in the kiln, if we reflect that in each individual grain, the surface is very speedily dried by the elevated temperature of the air it is at first exposed to; and then the superficial particles abstract the moisture from the internal ones with considerable avidity; the external ones being already sufficiently warmed give out this acquired moisture in the form of vapour, which is eagerly taken up by the passing current of warm air, the miscibility of which with water is increased by its increased temperature; and I am certain that a greater degree of heat may safely be applied while the grain is constantly turned, than could possibly be allowed, if it lay at rest, whereby the part immediately exposed would inevitably be overdried. It may also be mentioned that during the time the kiln is at work, the operation of screening is to a certain extent constantly going on, by which, much of the dust, seed, insects, and other extraneous matters are separated; and it is well known that grain cannot be too well screened from all impurities, previous to storing, as its perfect preservation depends much on that circumstance. The rapidity of its operation is such, that when it was tried on two different days before I left it, the grain flowed from it perfectly dried, four bushels and a half, in five minutes and a half, being at the rate of 29 load, or 145 quarters per day; which can only be accounted for by the circumstance of the aqueous vapour being carried clear away at once, without any part of it being deposited on other grains, and from the great quantity and rapidity of the current of warm air which constantly passes between the grains, taking up the humidity as quick as it is converted into vapour; for the temperature within the kiln, as far as I could reach to hold the thermometer, did not exceed 94°; and, indeed, I scarcely know how I can show the imperfections and inferiority of the ordinary system plainer, than by saying that the grain (under an average state) does not require to remain in the new kiln longer than half an hour; while the same wheat will not be dried on the old kiln in less than seven hours and a half. Thus the advantages when compared with the common mill-kiln will be seen to be these—the horizontal space it occupies is not more than one-thirtieth of that which would be occupied by the ordinary kilns capable of performing the same quantity of work; it saves all the labour of the scoop, required in charging, turning, and discharging the common kiln; the wheat is kept in a constantly uninterrupted state of turning, infinitely superior to that by the agency of the scoop, as not even a single grain can remain at rest; the comparative consumption of fuel is much lessened, being about half a bushel per load, and common coal is more suitable for the purpose than culm, which gives less flame, and is more expensive; it is dried with perfect equality, and above all, the quantity it will dry is six or seven times as great as by the common method; for the kiln which was removed to make room for the new one, dried (as before stated), on the average, fourteen quarters and a half per day, and it will be seen by the accompanying certificate, that the medium quantity is 95 quarters; then, as 95 : 14·5 : : 6·5 : 1. Or if we take the quantities before-mentioned, the proportion will be as 10 to 1. For, as 145 : 14·5 : : 10 : 1. This to the corn merchant is an advantage of much importance; as frequently, on sudden changes of the markets, it is desirable to ship the grain with the utmost despatch, but the shipment is often much delayed by the necessity of kiln-drying the cargo previous to loading the vessels; by which delay, arising from the tardiness of the common operation, the advantages of a good market are not unfrequently lost.

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* The height of the fire from the ground, renders necessary some convenient means of reaching it, for which purpose a platform is raised about 4 feet 6 inches, supported on brackets which are bolted on to the two front columns; and on this platform the man stands to attend the fire; which, if (as I have elsewhere observed) the whole kiln is brought lower down, would be unnecessary.

I have in the outset noticed the occasional necessity that farmers are under, of drying their crops of corn, peas, beans, &c., and for the use of the farmer only, this kiln may be made of less size, unless in very large establishments, but it is on a large scale that the advantages will be best shown; neither does the expense increase directly as the dimensions. The application of the principle here used, to the purposes of malting, is easy and evident; but considerable modification in the detail would be requisite, as the germination of the radicle would prevent that kind of semi-fluidity of motion which simple granular substances are susceptible of.

Thus having stated all that appears to me requisite to render the thing clearly understood, I beg to repeat that my perfect conviction of its usefulness and importance in the preservation and preparation of one of the most valuable and indispensable articles of human sustenance, is my inducement to submit it to the Society's consideration, and if any further information is required, I shall feel happy to give it in person.

JAMES JONES.

CERTIFICATE.

Bedhampton, near Havant, Hants,
April 30th, 1823.

This is to certify, that Mr. J. Jones, of High Holborn, did, in July 1822, erect for me a kiln for drying wheat, on an entirely new construction; that it occupies very little space; it saves the labour of the scoop in charging, turning, and discharging, as in the common kiln; the grain is kept constantly in slow motion, whereby the drying is more equal; and it will dry from 60 to 130 quarters in 24 hours.

John Snook.

A farther Certificate, to the same effect as the preceding, has been received from E. F. Hawes, Esq., of Crowborough Lodge, East Grinstead, for whom Mr. Jones has constructed a kiln.

N° VIII.

APPARATUS FOR BALING SHIPS.

The Large Silver Medal *was this Session presented to Mr.* James Dennett, *of Newport, in the Isle of Wight, for* an Apparatus for Baling Ships. *The following Communication has been received from him on the subject, and a Model of his Apparatus has been placed in the Society's Repository.*

SIR; April 15th, 1823.

When a ship springs a leak at sea, and from the extent of the injury, or from the pumps becoming worn, they are found insufficient to free her of water; the most usual method resorted to, is that of baling with canvas buckets, at the several hatchways, which after the most painful and long-continued exertions, but too often proves ineffectual in preventing the ship from going down. A consideration of the deplorable and extensive loss of human lives, occasioned by these occurrences, has led me to the invention of a "Machine for Baling," which I think will be found a powerful auxiliary to a ship's pumps in all cases of danger. Its extreme simplicity, and facility of application in vessels of every class, and its occupying so little room when not in use; will, I flatter myself, be found such as to recommend it to the consideration of the Society for the encouragement of Arts. I therefore take the liberty of soliciting you will do me the favour to lay the accompanying model and description before them, at their next meeting; for which I shall feel greatly obliged. Should it hereafter be instrumental in saving a single ship from destruction, or even the life of but one individual, it will be to me a source of the highest gratification.

I am, Sir,
&c. &c. &c.
JOHN DENNETT.

To A. Aikin, Esq.
Secretary, &c. &c.

Reference to the Drawing of Mr. JOHN DENNETT'S *Apparatus for Baling Ships.—Plate VII.*

Fig. 1, *a* and *b*, parts of the hatchways of the upper and lower decks: *c c* a long rabbeted slide, reaching from a little above the coamings of the upper deck to the ballast in the hold; it is requisite that it should decline from a vertical position, therefore it is attached to the lower hatchway by a thick block *d; e e* a square bucket made to slide on the rabbet of *c c*, its bottom is a flap-valve so that when it slides down into the water it fills at once without any particular attention on the part of the workmen. The upper portion *f* of the rabbet of the long slide is made detached, and is fixed in its place by a pin *g* (in the top of the forks) on which it turns as on an axis; the bucket is shown discharging the water on the upper deck; when the rope *h i k* is let go, the bucket falls down, rights itself, and the portion *f* of the slide falls into its place as *f* fig. 2, before the bucket begins to descend; this, however, it would not do if the slide did not incline, nor unless the block *l* was sufficiently on the same side to bias it against the slide; but as it is, it runs down to the bottom, as shown by dotted lines, where it fills with water, and is drawn up by pulling the parts *i* and *k* of the rope, the part *k* having passed through a block *m* on the deck; a pin, *n*, fig. 2, is fixed as a stop in the top of the rabbet, so that when the bucket rises up and is only on the loose portion *f* of the rabbet, it is stopped by the pin *n*, and the loose portion *f* by farther pulling rises out of its place and upsets the bucket, as in fig. 1; then, to prevent the bucket being pulled higher than enough to spill the water, in which case it would fall on the deck instead of returning, a knot *o* is worked on the rope to stop against the block *l*, which effectually prevents it from rising too high. The block *l* is made fast to a yard arm, and the upper end of the rope *k* is made fast either to the same or elsewhere only just long enough to let the bucket reach the bottom of the slide, by which it is prevented from going off there if the slide should not reach to the bottom of the hold. Fig. 3 shows a front view of the upper or fork-like portion of the slide *c*, the moveable piece being removed.

Fig. 7, a bird's-eye view of the bucket and slide separated.

Nº IX.

MODE OF COMMUNICATING WITH VESSELS STRANDED ON A LEE-SHORE.

The GOLD VULCAN MEDAL *of the Society was this Session presented to* CAPT. DANSEY, *of the Royal Artillery, for* A KITE FOR EFFECTING A COMMUNICATION BETWEEN A STRANDED SHIP AND THE SHORE. *The following Communication has been received from the Candidate, and the Apparatus has been placed in the Repository of the Society.*

SIR; Woolwich, 28th Feb. 1822.

I BEG to submit to the Society for the encouragement of Arts, &c. the outline of an expedient for facilitating communication with vessels stranded on a lee-shore, or under other circumstances where badness of weather renders the ordinary means impracticable.

A sail of light canvas or holland (being cut to the shape, and adapted for the application of the principles of the flying kite), is launched from the vessel or other point to windward of the space over which a communication is required, and as soon as it appears to be at a sufficient distance, a very simple and efficacious mechanical apparatus is used to destroy its poise, causing it to fall immediately, but remaining still attached by the line, and moored by a small anchor, with which it is equipped. The result of the experiments which I have made with a kite of sixty feet of surface, has been, in a strong breeze, the extension of a line weighing sixty pounds, and measuring three hundred and fifty yards in length, and one inch and three quarters in circumference; and at another time the extension of a line weighing thirty-seven pounds, and measuring eleven hundred yards in length, and five-eighths of an inch in circumference.

Being aware, as well from public documents as from my own experience of the value of expedients for the purpose in question, I am desirous of giving publicity to mine through the medium of the Society of Arts. I am prepared to exhibit the detail of the apparatus, and to illustrate its application by experiment, and if the Society of Arts shall think it worth their while to obtain a report upon it, and that report be such as to render it worth their acceptance, a pattern of it, with the necessary drawings and description shall be at their service.

I am, Sir,
&c. &c. &c.
C. C. DANSEY,
Captain, Royal Artillery.

To A. Aikin, Esq.
Secretary, &c. &c.

Description of a Kite and Apparatus for obtaining Communication with Vessels stranded on a Lee-shore, or otherwise where badness of Weather renders the Application of the ordinary Means impracticable.

The kite, Plate XIV, figs. 1 and 2, is a sheet of Holland, exactly 9 feet square, extended by two spars, the standard, *a a*, placed diagonally, and the cross piece *b b* at right angles across it, and intersecting two sides of the square at ⅕ from the angle to which one end of the diagonal spar is fixed; by this means that part of the surface of the square which is extended by the spars, forms a figure of about 55 square feet of surface, composed of two triangles, one right-angled and one isosceles; which is a very convenient shape for a kite; and the part of the square not extended operates as wings, *c c*, to steady it in its flight. At two points on the diagonal spar, about ¼ of its length from the head and the same from the bottom, two lines are attached, the upper about ¼ of the length of the kite, and the lower ⅓ of its length, which, combined, form the belly-band *g g*, fig. 2; and the line which is to retain the kite is attached to the point of their junction with each other *k*, as seen in the plate; also, when the kite is large and there is much wind, as many intermediate lines as may be thought necessary to strengthen the spar may be added. The tail may be 5 or 6 times the length of the kite, and its weight must be proportionate to the wind; but if its bulk be much diffused, and so arranged as to admit of the uniform and constant action of the wind upon it, it will be displaced from that position which is most favourable for steadying the kite; and if much concentrated, it will acquire a violent vibrating motion, equally destructive of its function. The best appears to be one formed of a double cord, whipped at equal intervals with packthread, so as to form a succession of loops or eyes into which pieces of wood are thrust in order to give the requisite weight, see *f f*, fig. 2. The kite above described has, in a strong breeze, extended 1100 yards of line ⅝ of an inch in circumference, and would have extended more, had it been at hand. It also extended 360 yards of line 1¼ inch in circumference, and weighing 60lbs. The Holland weighed 3½lbs, the spars, one of which was armed at the head with iron spikes for the purpose of mooring it, 6¼lbs., and the tail was five times its length, composed of 8lbs. of rope and 14lbs. of elm plank, weighing together 22lbs. Thus far, nothing more than the well-known property of the flying kite, and its power, developed to a greater extent perhaps than has often been practised, are involved; and to render that property and power available for the purpose in question, an apparatus has been contrived, which enables those to windward to destroy at will the poise of the kite, and cause its immediate fall, without however detaching it from the line; and those to leeward to restore its poise and effect its immediate ascent.

The apparatus now to be described is that which has been used with a kite of the above-mentioned dimensions. It consists of four parts, which for the sake of distinction, may be designated the ring, the catch, the striking bar, and the wedge, forming the apparatus *m*, fig. 2, and the messenger.

The first is a strong iron ring *o* of about 1½ inch in diameter, having four cords, 18 inches or 2 feet long, fixed at equal distances on its circumference, and all joined together at about 3 inches from the ring and attached to the kite (at the extremities of those lines which are to regulate its poise) by the others. The catch, fig. 4, is made from a piece of tough strong wood, 6 inches long and 1 inch in diameter. It has two saw-cuts at right angles to each other through half its length; there is a hole about ¼ inch in diameter, beginning in the centre of the end opposite to where the saw-cuts begin, passing about 2 inches along its axis, and then obliquely to the surface, which it meets at about ½ an inch below the end of the saw-cuts. Through this hole, the line of the kite *c* passes, and it is fixed in it, within about a fathom of the end which is the side next the saw-cuts, and so that the catch cannot slide either one way or the other. The wedge *p*, figs. 6 and 7, is about 2 inches long, it has eight faces, and its transverse section would be a four-pointed star; it is fastened by a cord at its thick end to the cords of the ring where they meet.

To prepare the kite for its ascent, the ring is placed over that end of the catch where the saw-cuts begin (which it will be observed have divided it into four equal-sized fangs, whose inside surfaces exhibit eight faces to correspond to those of the wedge), and the wedge *p* is placed within the fangs or double cleft, which it will extend so that the ring is caught in a groove which goes round the whole circumference of the catch, and cannot be taken off again, until the wedge is removed. Therefore it appears, from the manner in which the kite has been described to be attached to the ring, the ring to the catch, and the catch to the line, that the connexion between the line and the kite is complete, but ready to be broken by the removal of the wedge, which would allow the fangs of the catch to contract, and the ring to pass over them and be disengaged. The messenger, shown in section *l*, fig. 7, is a hollow cylinder of strong wood, about 6 inches long, and its interior diameter about 1½ inch, so as to pass freely over the catch, and has a small sail rigged upon it perpendicular to its axis. When it is required to lower the kite the line is passed through the cylinder of the messenger, and the wind takes it rapidly up to the kite; when it comes upon the catch, it meets with the striking bar *n* (an edge view of which is represented fig. 5) which passes across the small end of the wedge, through one of the saw-cuts, and projects on each side about ½ an inch beyond its surface. The violence of the shock with which the messenger meets the bar, drives out the wedge, and by allowing the fangs of the catch to collapse disengages the ring. The connexion with the belly-band is thus broken, and the cord *e* remains attached to the grapnel *d*, the ring and wedge remaining pendent from the belly-band, as *i*, fig. 1. The centre of suspension being thus transferred to the head of the kite, its rapid descent is the necessary consequence.

In the experiments that have been made with a view of gaining communication with a lee-shore, under the supposition of no assistance being there at hand, a grapnel, *d*, fig. 1, consisting of four spear-shaped iron spikes, was fixed to the head of the kite so as to moor it on its fall; and in this emergency, the attempt of some one to get on shore along the line would be the only means to be resorted to. In those cases where maintaining a correspondence after a communication was gained has been the object, the person to windward has attached a weight to the messenger, in some cases as much as three pounds, which having been carried up, has of course descended with the kite; the person to leeward has then furled the sail of the messenger, and loaded it with as much weight as the kite could lift, then replacing the ring and wedge, and exposing the surface of the kite to the direct action of the wind, it has rapidly risen, the messenger running down the line to windward during its ascent. There are a few minute points to be attended to in the construction of this apparatus, which would become so obvious in the progress of preparing it, that it would be useless to add them to a detail, already perhaps too tedious. But it is to be observed that in cases where the wind is not violent enough to take off the kite at once from the deck, or where eddies prevent its impulse from acting fairly and uniformly on its surface, the line of the kite may be passed through a snatch-block, from which another line leads through a block on some high point in the rigging, and it may thus be raised high enough for the wind to take it and clear it of the vessel.

In fig. 3, *l* is the messenger, which, after it has struck and liberated the belly-band is itself retained in the represented position by the striking bar *n*.

Fig. 8 is an end view of the ring, cylinder, and wedge, showing their mutual connexion.

In making use of Captain Dansey's Apparatus for establishing a communication between a stranded vessel and the shore, little more attention or skill is requisite than in flying an ordinary kite.

With regard to the construction of the kite the proportions established by the inventor should be carefully adhered to, particularly in the position of the cross-spar, which if placed too low will prevent the kite from rising well and flying steadily. On the contrary, when the centre of the pressure of the wind upon the surface is as much above the centre of the upright spar as can be conveniently contrived without diminishing too much the surface exposed to the wind, the best effect will be produced.

The loose portions of canvas which form the wings, may be removed or not without at all affecting the flying of the kite.

The good effect of the tail in balancing the kite will principally depend on the due proportion of its length and weight to the size of the kite and the strength of the wind.

The length and weight of the tail sufficient in a moderate breeze to keep the kite steady, and to ensure its descent when the messenger has been let off, will be inadequate in a strong wind. The best proportions are to be determined by actual experiment upon each particular kite exposed to a greater or less intensity of wind. In some cases, a single line of ten or twelve times the length of the kite, and of suitable thickness, will succeed perfectly well; in other cases, several smaller lines united at intervals by lashing, with a single piece of board attached to the extremity of the tail, has produced an equally good effect.

In attaching the kite-line to the grapnel, a considerable portion of it should be left to hang loose, in order to prevent any derangement from taking place in the discharging apparatus. It might even be advisable to slip on a smooth metal ring of some weight.

In the apparatus laid before the Society, the inventor has placed the grapnel at the head of the kite, in which situation it performs the office of a galley-anchor, with its shank reversed. The grapnel might however be applied, with equal advantage, to the lower extremity of the kite, the points or flukes being still turned upwards. By the latter contrivance, it would perform the office of a similar anchor, with its shank in the usual position.

As the certainty of effecting the communication between the vessel and the shore depends principally on the hold which the grapnel takes in the ground, the communicating line must necessarily be attached to the head of the kite; for if it were attached to the lower extremity the whole apparatus would, in descending, take a rotatory motion, the effects of which would entirely frustrate the success of an operation which should lead to so important a result.

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N° X.

REGULATING THE STRAIN ON TACKLES.

The Large Silver Medal *was this Session presented to Mr.* J. Evans, 12, *Ellen Terrace, Ellen Street, St. George's in the East, for his* Method of regulating the Strain upon Tackles *combined in one Effort, according to the relative Powers of such Tackles. A Model of Mr. Evans's Apparatus is placed in the Society's Repository.*

Mr. Evans stated before the committee that he is in the service of the London Dock Company, in which situation he has frequently had occasion to observe the difficulty experienced in raising large logs of timber, or heavy blocks of marble from the holds of ships, from barges or other craft, to the top of the wharfs. No single crane, or tackle, being adequate to the required effort, it is necessary to combine two or more; but in these circumstances no mode being practised of proportioning the strain upon each machine according to its strength, it not unfrequently happened that one tackle being overloaded gave way, the consequence of which was, the failure of the others also: hence originate loss of time, destruction of machinery, and the risk of serious accidents to the labourers employed. On one occasion, when a large block of marble was in the act of being raised, the fall broke

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from over-straining, and the side of the ship sustained much damage from the accident; on another occasion the legs of the sheer gave way, and, in consequence, the tackle, crane, marble, and barge, all went down to the bottom together.

In order to prevent the recurrence of such accidents, Mr. Evans invented the mode of combination about to be described, and the directors of the Dock Company have carried it into execution.

In discharging the cargoes of ships, and on other occasions, requiring great weights to be lifted, it often occurs that a single crane, or windlass, or crab, or other similar instrument, is insufficient for the purpose. The power of two or more, therefore, must be combined, in which case the practical difficulty occurs, how to combine machines of equal or different powers, so as that each shall bear its proportional load, not only at the commencement but during the whole of the operation. It is manifest that if each engine has an independent hold of the weight to be raised, the partition of the load among the engines according to the relative power of each is mere accident. A rope, or bridle, of sufficient strength to sustain the whole weight must, therefore, be properly fixed, the power of each engine being then applied to the bridle by means of its own block, or tackle, it is obvious that the load will be equally divided among all the engines; and if in the progress of the work any of the engines does more or less than its due proportion, the block of such engine will advance faster or slower than the other blocks, and thus, by indicating the irregularity, offers at the same time the means of rectifying it by taking care that the block of each engine advances at an equal rate.

Up to this point, Mr. Evans's contrivance (though original on his part) is not new, it having been proposed three years ago to the Society by Mr. Parsons, as a mode of equalizing the strain on many capstans, when applied to drawing a vessel up a slip or into a repairing dock. But Mr. Evans has besides taken advantage of the mechanical power of very easy combinations of pullies, so as to divide the load, according to the original difference in strength, between different machines combined in one effort, as well as to preserve the same proportional partition during the continuance of such effort. This will be evident from inspection of plate XV, in which

Fig. 1 is a side view of a crane, &c.

Fig. 2 represents a derrick and a crab, with a pair of blocks and fall, &c.

The crane is supposed to be capable of lifting double the weight of the derrick, &c.; they are both represented as applied to lifting a block of marble.

The regulator in this case consists of a moveable and fixed pulley *a* and *b*, together with a chain *c*; *d* is a block of marble or any other weight to be lifted, with a chain or slings fixed round it, for hooking or fixing the regulator to; the moveable pulley is hooked on to the end of the crane chain; one end of the chain *c* is hooked to the chain or slings *e*, and passed over the moveable pulley *a*, and under the fixed pulley *b*, and is then fixed to the hook of the lower block *f*; it will be obvious, by this arrangement, that the crane can only lift two-thirds of the weight and the crab one-third, as long as the pulley *a* and the block *f* are nearly level with each other; but in case the crane hoists faster than the crab, &c. the block *f* will be brought in contact with the fixed pulley *b*, then the crane will have the whole of the weight to lift; or in case the crab, &c. hoists faster than the crane, the pulley *a* will be brought in contact with the pulley *b*, and then the crab, &c. will have the whole of the weight to lift.

Fig. 3 represents a method of fixing a regulator when two powers of equal strength are to be applied.

The power is to be applied to the upper rings, or hooks, and the weight to the lower hooks of all the following figures.

Figs. 4 and 5 represent two methods of fixing a regulator when these powers are to be applied, the first power to lift one half and the other two to lift one-fourth each.

Fig. 6 represents two methods of fixing a regulator; the first, when three powers of equal strength are to be applied; the second, when three powers are to be applied, the first to lift two-thirds and the other two to lift one-sixth of the weight each: the only difference between this arrangement and the last is, that the pulley *j* is removed and hooked on to the ring *k*.

Fig. 7 and 8 represent two methods of fixing a regulator, when four powers of equal strength are to be applied.

Fig. 9 represents a third method of fixing a regulator, when four powers are to be applied; the first power 1 to lift half, the second power 2 to lift a quarter, and the third and fourth powers to lift one-eighth each.

Fig. 10 represents a fourth method of fixing a regulator, when four powers are to be applied; the two first powers to be applied to the hooks 1 and 2, which will lift two-sixths each; the two second powers to be applied to the rings 3 and 4, which will lift one-sixth each. And by extending the same principle any number of powers may be applied to lift any weight with safety.

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Nº XI.

SAFETY APPARATUS FOR DRY-GRINDERS.

The GOLD VULCAN MEDAL *was this Session presented to Mr.* J. ELLIOTT, *of Sheffield, for his* APPARATUS *for the use of Persons employed in the various Branches of* DRY-GRINDING. *A Model of the Machine has been placed in the Society's Repository.*

THE experiments made by Mr. Abraham to obviate the dreadful consequences of dry-grinding to the men employed in it, and the publication of his inventions for that purpose in the Society's Transactions, Vol. XL. though not immediately productive of any considerable effect, have indirectly led to the discovery and adoption of means from which, as the certificates show, great and permanent advantages will probably be derived.

The following explanation of the engraving will convey some idea of the nature and mode of application of the contrivances, and the annexed certificates will show the opinion of those persons best calculated, by their pursuits and peculiar information, to form an estimate of their value.

Fig. 6, plate XVI, is a side view of a Sheffield grinder's wheel, with the preservative apparatus attached. *a* is the wheel, *b* the grinder's seat, *c* a close box into which the grit and steel dust are thrown by the motion of the wheel, and from which it escapes through the chimney *d d* into the open air, being driven by the current produced by the revolution of the wheel. The chimney is not open at its end, but on the underside, as shown in fig. 9, in consequence of which the stream of dust is not liable to be blown backwards by sudden gusts of wind. The front of the box *c* is partly inclosed by pieces *e e* (see fig. 7 which is a bird's-eye view of part of the apparatus), and the inclosure is completed by two curtains *f f* of leather, or canvas, shown in the front elevation, fig. 8. The part *g* of the box lifts up on hinges, as shown by the dotted lines in fig. 6, and it can be maintained at any elevation by a pin *h*, for which a series of holes are made in the side of the box. The lifting part *g* is omitted in fig. 7, for the purpose of showing a piece of leather *k*, which makes the bottom of the box fit closely to the stone under all circumstances. This is necessary, because as the stone is reduced in diameter by use, it would cease to fit the aperture made in the box for its revolution, and would permit the escape of the dust, which is prevented by occasionally adjusting the leather or canvas *k*. The curtains *f f* are suspended from the lifting part *g*, and are elevated with it. Should any fires be burning in the room when this apparatus is used, apertures in the walls or windows should be made, to supply them with air, or the current produced by the wheel will be counteracted by that which will enter by the same channel to supply the fires.

CERTIFICATES.

SIR; Sheffield, 9th May, 1823.

We are requested by T. Champion, esq., the master cutler, to state to you our opinion as to the utility of Mr. Elliott's apparatus for dry-grinders.

We beg respectfully to state, that our dry-grinders use Mr. Elliott's apparatus, and find it of the greatest utility; before the application of the apparatus in question, the room in which the dry-grinders were at work was charged with a disagreeable sulphureous dust arising from the stones, steel, and metal, when the workmen were at work, which was, no doubt, the principal cause of destroying their health, and bringing them to a premature death; but since we adopted Mr. Elliott's invention, we have the pleasure to say, the atmosphere of the room where the dry-grinders are at work is now clear of dust, and we have now the pleasing anticipation of preserving both the health and lives of that useful class of men, by rendering the atmosphere in which they breathe more pure and healthy. Hoping our remarks may be of use to the ingenious inventor,

We are, Sir,
&c. &c. &c.
THOMAS ELLICE, & Co.

P.S. We shall be happy to show any gentleman our grinding place, who will take the trouble of calling on us, and who may be desirous of witnessing the effects of Mr. Elliott's apparatus.

SIR; Sheffield, 17th May, 1823.

SINCE my return home I have conversed with several of the committee appointed at this place to investigate the merit of Mr. John Elliott's invention for the benefit of dry-grinders; on calling upon one of them I was, for the first time, shewn a pamphlet enumerating the subjects for which premiums had been proposed in the Session 1822 and 1823, by the Society of Arts, in London; among which to my agreeable surprise, is the following: it will be found in page 30, number 253, but which was not adverted to as one of the rewards offered by the Society.

"To the person who shall invent and produce to the Society, a mode of obviating the prejudicial effects that attend the operation of pointing needles and other branches of dry-grinding, during which, the particles of grindstone-dust, steel, and iron, being thrown into the air and received with it into the lungs, occasion asthma, consumption, and other painful disorders; the gold medal or thirty guineas."

A conviction upon my mind that the machine invented by Mr. Elliott (simple in its form, but powerful in its effects) fully accomplishes the object sought after as above, by the Society of Arts, prompts me with all deference, to appeal to yourself, and the other gentlemen of the London committee, as to Mr. Elliott's becoming the candidate for the gold medal. The value of this great discovery here becomes better appreciated and its adoption more extensive; I believe I mentioned, that to my own knowledge, twelve of the grinders life preservatives had been fixed up in this town, but it is ascertained upon an examination just made here, that upwards of thirty are in constant use, and at this time more are preparing. Humanity rejoices at the prospect of this diminution of suffering among a laborious and useful class of artizans, whose lives, hitherto, seldom extended beyond forty years, whilst in some departments of dry-grinding they appear to have been limited to thirty; it may perhaps not be improper to notice further, that the expense of these machines is very moderate, viz., 10*s*. 6*d*. each; that the workmen find them not to interfere with their business, but rather afford facilities and conveniencies.

I am, Sir,

&c. &c. &c.

THOMAS CHAMPION, *Master of the Cutlers' Company, Sheffield.*

N° XII.

IMPROVEMENTS IN THE RIGGING OF SHIPS.

The SILVER VULCAN MEDAL *was this Session presented to Lieut.* WILLIAM PRINGLE GREEN, *R. N.*, FOR CERTAIN IMPROVEMENTS IN THE RIGGING OF SHIPS, *Models of which have been placed in the Society's Repository.*

THE unfortunate issue of several naval actions with the Americans during the last war, in which British frigates were captured, first attracted Lieut. Green's attention to the subject. In analysing these, it appeared that a principal cause of the success of the enemy, was the rapidity with which he shot away the rigging, and consequently disabled the masts of his opponent.

The masts of ships are secured in two directions; longitudinally, by means of long ropes called stays, and in a transverse direction by means of other ropes called shrouds, each of which has a loop in the middle which is passed over the head of the mast, while the two ends are fastened to blocks called dead-eyes, fixed on each side the ship opposite to the mast. Each pair of shrouds, therefore, may be considered as forming the sides of an isosceles triangle, of which, the apex is the mast-head, and being in pairs, it necessarily follows, that if one is shot away, its antagonist, or opposite shroud, becomes nearly useless. Lieut. Green, therefore, proposes that the shrouds should be single, and that each should be terminated at top in a strong iron hook, to take hold in an eye fixed in a strap or plate at the mast-head.

Another improvement proposed by the same officer is in the method of slinging the topsail-yards, by fixing to the yard where it comes in contact with the mast, a kind of clasp or crutch, similar to that at present applied to the mizen-boom; which, by half embracing the mast, serves to steady the yard, and to prevent those violent jerks, by which, in blowing weather, men are not unfrequently thrown from the yard into the sea; it has the farther advantage of saving the expense of rolling tackles, besides strengthening the yard in the slings and quarter.

During the last war Lieut. Green commanded a brig-cutter, the two masts of which were secured and rigged in the usual way. He obtained leave to add, at his own expense, a small mizen-mast, for the purpose of submitting his plan to actual experiment; the result of which, as far as it went during the two years that the experiment lasted, was entirely to his satisfaction.

Reference to the Engraving of Lieut. W. P. GREEN's *Method of fixing the Shrouds to a Mast, fitting Top-sail-yards and Braces.—Plate XVI.*

Fig. 3, *a* and *b*, two square iron straps fitted on the mast head, one above the other; they have three hooks on each side of them to receive the tops of the shrouds, those above are placed so as to alternate with those below, as shown fig. 2, in order to give room for the eyes of the shrouds and let them come sufficiently close.

a and *b*, fig. 1, show the shrouds fixed on the hooks.

Fig. 4, a front view of one of the straps.

Fig. 1, *c c*, the top-sail yard having chocks *d d* to embrace the top-mast half round, and thereby prevent the yard swinging end ways.

Fig. 5 shows a bird's-eye view of part of the yard *c c*, and of chocks *d d*, embracing the mast.

Fig. 1, *e e*, the braces of the top-sail yard; they are fixed at *f*, pass through the blocks *g g* at the yard arms, then through the blocks *h h*, and are secured at *i*.

PAPERS

IN

COLONIES AND TRADE.

N° I.

WHITE HERRINGS.

The Sum of FIFTY GUINEAS *was this Session presented to Mr.* J. F. DENOVAN, *of Aberdour, Fifeshire, for the continued zeal and success with which he has entered into competition with the Dutch, in the early supply of the Hamburgh Market with* PICKLED HERRINGS *of very superior quality, thus demonstrating that this very important branch of Commerce is compleatly accessible to British enterprise.*

IN the Society's premium list for the Session 1821 and 1822, the gold medal or fifty guineas, is offered for the best sample of white herrings cured in Great Britain or Ireland. For this premium Mr. Denovan who had been rewarded in the

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two preceding years for an improved method of curing herrings, and for his successful competition with the Dutch, in the Hamburgh market, became a competitor. His letter on the subject, dated 18th December, 1821, was duly received, as well as a 16 gallon cask of herrings. From the tenor of his letter it did not clearly appear whether he was a candidate for the premium for curing, or for that for exporting cured herrings, and a letter requesting explanation on this head was sent to him by the secretary, on the 21st of the following month. Before the arrival, however, of this letter, Mr. Denovan was gone to prosecute the fishing on the West coast of Scotland, and it did not reach him till the month of May. On the 15th of that month he answered the Secretary's letter, and forwarded a certificate from Messrs. Cordes and Grönemeyer, of Hamburgh, attesting the excellent quality of the herrings forwarded by him to them, for sale in that city. Together with these documents was sent the following essay on the natural history of the herring, and on the herring fishery.

These papers, however, did not arrive in time to be taken into consideration, and to be reported to the Society before the commencement of the vacation. The cask of herrings sent as a sample was therefore not opened, but was placed in the Society's repository, with directions that it should be rolled over from time to time. Notice of this being sent to Mr. Denovan, a letter was received from him on the 28th of the following December, containing a general account of his proceedings during the last fishery, and announcing that he had sent a cask of the present season's herrings to replace that formerly sent, which from its having been kept a year longer than was intended, would probably be found in a bad state.

This second barrel duly arrived, and on the 28th of

February, 1823, the Committee proceeded to examine the contents of the two barrels.

The fish last sent greatly resembled those for which Mr. Denovan was rewarded two years ago. Their scales were quite bright, the flesh was white, perfectly well preserved, but somewhat hard and with but little flavour. Those which were received the year before, and which, from their having been kept on the ground-floor of the Society's house during a very hot summer, were expected to be tainted, presented the following appearance: their scales were not so bright as of the preceding, nor was their flesh so white, it having become of a pale yellowish brown, at the same time it was found to be soft and mellow without being in the least degree flabby, and the flavour was unanimously considered as far superior to that of the recently-pickled fish. Thus, the accident which prevented the investigation of this claim at the regular time, has had the beneficial consequence of showing that Mr. Denovan's herrings may be kept through the second year, under circumstances in several respects not very favourable, not only without receiving any injury, but with a manifest improvement, especially in those characters which constitute the peculiar excellence of the Dutch herrings.

SIR;

HAVING been favoured by a friend with a copy of the printed list, about the middle of December last, and observing that the Society had again offered their gold medal or fifty guineas, for the best sample of white herrings (No. 199), I forwarded to Mr. Vaughan, a sixteen gallon barrel, containing a fair specimen of about one hundred and fifty barrels, cured by me, on the West coast of Scotland, one hundred and forty-two of which were exported to Hamburgh, in June and July, 1821; but it being impossible to procure certificates from Hamburgh, drawings and other materials illustrative of the subject, in time to be delivered in by the first Tuesday in January following, I resolved to abandon any claim I might otherways have had to the premium, and to draw up at leisure and present to the Society such a communication on the state of the British herring fishery, as might, I conceived, be worthy their attention and approval.

I had previously determined to write and publish a treatise on the British white-herring fishery, which from the experience I have had, the labour I have taken, and the information I have collected, I felt justified in thinking, would throw more light on the subject than any thing of the kind which had gone before it; but I have deviated from my original plan, and endeavoured to compress the whole into a less shape, which I now offer, with much deference, to the Society, in the form of an essay.

My former communications to the Society contained succinct details of my proceedings during the years 1817, 1818, and 1819; and it will now be necessary by way of introduction, and before entering on other topics, to continue the detail by relating what I have done, and what improvement I may have made since that period.

In the beginning of June, 1820, I proceeded, as on former years, to the West coast; but it was some time before the herrings made their appearance—those that first appeared off the headlands and bays, came in such very small quantities that it was impossible to cure them, some fishermen not being able to obtain more than an hundred or half an hundred within the twenty-four hours; and the boats were, consequently, so much spread, and at such distances from one another, that the herrings were generally sun-struck, which injured the scales so much that I could not attempt to cure them. All herrings which are allowed to lie exposed to the sun, or even to rain, for any length of time before getting salt, appear of a lead colour, and no care or attention afterwards will ever restore the brightness of the scales. They also become extremely soft, and cannot be brought by pickling, to that degree of firmness which is necessary for their preservation; for I have found, by repeated experiments, that they do not discharge, as fresh-caught herrings do, the fixed oil, on being primed, but seem rather to absorb it. Hence it is impossible they can either be well flavoured, or expected to keep for any length of time; and this is, among others, the reason why a great proportion of the herrings cured by coopers and peasants on the North and East coast of Scotland are black at the bone and so very inferior to those of Holland.

Independently of quantity, I also found that the herrings were inferior in quality to those of the preceding year, the greater part being what are called by the Dutch, *Nacht Skaam* or *Sea Sticks*, a species of herring which will not find a market in Hamburgh: on the contrary, if only a few of such fish are admitted into a barrel of sound herrings, they will not bring one-third of the price they would otherways have done.

The appearance of the herrings in general, was poor, and they were more lean and less succulent than I had found them in former years. After a few fine showers, however, they began to improve, and the shoals became larger. It was, however, the 20th of June before I could venture to cure; and on the 27th I had only twenty-eight barrels primed or bung-packed, the contents of which were packed from as great a quantity of herrings as would have filled, at least thirty barrels; but this was absolutely necessary from the quantity of sea-sticks and stragglers that appeared in every net. Finding that the canal gates were shut (to admit of some repairs being made on the locks or banks, which are generally performed at Mid-summer), I sent my herrings to Glasgow; and, in order to save time, had them conveyed to Leith by carts, an expedient which nothing but necessity could warrant; for the jolting of the carriage and the exposure of the casks to the sun, is extremely injurious to the herrings in many respects; but I had no choice, for a few days might have enabled my opponents, the Dutch, to reach market before me. On arrival at Leith, I found that the herrings had suffered considerably: two of the barrels had lost nearly all the pickle, while a great proportion of the fish, by rubbing against the ends and sides of the barrels, were not only divested of their scales, but had their skins stripped off as if they had been rasped with a large file. Of the twenty-eight barrels, I could only make up twenty-four that were at all passable, which I shipped by the smack Albion, and consigned to the respectable house of Cordes and Grönemeyer, of Hamburgh. They left Leith on the 29th of June and reached their destination on the 4th of July, four days before the first Dutch jager, and, with all their imperfections on their head, brought, by public sale, about 3,000 marks banco, netting a profit of about one hundred pounds sterling.

From the proportion of lean and poor fish that continued to appear in the herring shoals up to the middle of July, the small quantity taken, and the great prices that were given by the wherry-men who supply the fresh-fish market at Glasgow, I declined curing any more early herrings at that time; for although the prices behoved to decline in Hamburgh, they were still the same here; and as, by carefully picking the herrings, I should be forced to reject all the sea-sticks and lean fish, which cost me as much as the sound ones, I saw that no advantage could be gained by making a second exportation to Germany.

Over and above the twenty-eight barrels I also filled a quarter barrel and a few small kegs—the former of these I sent to the king, in uniformity with the Dutch, who always transmit a barrel of the first-cured herrings to their sovereign; I was honoured with a return from sir Benjamin Bloomfield, bart. by command of his majesty, who was graciously pleased to accept of my offering, and "considered the herrings to be of the finest and most delicate flavour."

Towards the end of August and beginning of September the herrings improved considerably, and I cured betwixt twenty and thirty barrels, which I afterwards packed into kegs for the supply of my agents at Edinburgh and other places: a considerable proportion of this quantity I cured by way of experiment, in the following manner:—

I caused the herrings, after gutting and assorting, to be regularly laid, in half dozens, on a thick plane-tree board, made on purpose, and the heads cut off by means of a knife with two handles, such as is used by tanners and curriers, which operation is easily performed by pressing down the one hand after the other. They were then packed into a barrel in the Dutch manner, that is to say, a little fine Cadiz salt was strewed on the bottom, and the fish laid fairly on their backs with the belly upwards, and so closely wedged together as to prevent them from sliding out of that position; betwixt each layer of herrings *half* the quantity of salt usually employed was carefully strewed with a tin drainer; and when the barrel was packed to within eight inches of the top, a quantity of strained or refined pickle, sufficient to fill the interstices, was poured in at the top: The lid was then put loosely on; and in this state they were suffered to remain for three days. On removing the lid the fixed oil was floating on the top, which being removed by means of a brush made with goose-quills (which I have introduced as preferable to the tin skimmer used by the Dutch and British), the pickle appeared much higher in colour than usual, and less slimy. A part of the pickle being then removed, the barrel was fully packed from another cask of the *same night's taking*, and a little salt being strewed on the top it was headed up. The barrel was next capsized and put on end, in which position it stood for eight days; it was then opened as it stood, and as some fixed oil still appeared, a quantity of pickle was poured in to make it rise, when it was wiped off as before; and the barrel, being packed with an additional layer of the same herrings, was headed up and laid on the *bulge* as being complete.

In my own opinion, these herrings were very superior in point of flavour and softness to the best Dutch herrings cured with heads; they were much more succulent, and from the whole of the blood-vessels being opened and discharged, would certainly keep much longer than those cured in the common way. But I am sorry to say, that the public were startled at their appearance; and without giving them a trial, purchased those with heads in preference. I sent a cask of those herrings to the king, in October, 1820, and had a return from sir Benjamin Bloomfield, bart., acquainting me that his majesty was much pleased with my attention; that the herrings were most excellent: and that the king had been most graciously pleased (as a mark of the royal favour) to appoint me purveyor of herrings to his majesty. I also sent samples of these herrings to several scientific gentlemen of Edinburgh, who expressed their approbation of the improvement; and were decidedly of opinion, that were our colonial merchants to order their herrings to be cured in this way, they would reap much benefit from the experiment.

In May, 1821, I freighted a very fine fast-sailing cutter, called the General Johnston of Greenock, with which I sailed from that port on the 5th of June following; but owing to the state of the weather (continued gales of wind from W. N. W. and N. N. W. with no rain) I could procure no herrings until the 23rd of that month. I also freighted a large open boat, and had her stationed at the mouth of one of the Highland lochs, where early herrings are frequently found. But all my endeavours to obtain herrings at all fit to be cured proved fruitless until the night of the 23rd of June, when a very few *maatjes* were got amongst a vast quantity of sea-sticks and stragglers. On the night of the 26th, I made up, with much difficulty, 25 barrels sea stock (that is to say, herrings in the priming which require to be afterwards filled up), which I sent on to Leith, where they were reduced to 23 barrels in the making up, and shipped to Hamburgh, on the 30th of June, by the smack Courier. After the first of July, when it began to rain, great bodies of herrings sprung up from the bottom of the deep, like a flock of small birds, with such velocity that the nets appeared to be raised by them above the surface of the water; and as the rain continued to fall they increased in number, and seemed to crowd into all the inlets and bays where the bottom was sandy, or where the points or projections of the coast indicated a profusion of algæ, common fucus, or other marine vegetables. On the 7th of July I sent to Leith 97 barrels sea stock, which were reduced, in filling up, to 89 full-packed barrels, and were shipped to Hamburgh on the 12th by the smack Rhine; and on the 14th I transmitted to Leith 48 barrels sea stock, 30 of which, when made up, were shipped to Hamburgh, by the smack Glasgow, and the remainder packed into kegs for family use, and sent to my agents at London, Edinburgh, Leith, and other places. Independently of the 25 barrels first cured, I also made up a cask for the King, which was sent off from Leith on the 2nd of July: These herrings gave so much satisfaction, that, as I was informed by a letter from sir Benjamin Bloomfield, bart., they were served up at the coronation-banquet by express command of his majesty.

My first shipment reached Hamburgh on the 5th of July, *five days before the first Dutch jager* arrived; but I was, nevertheless, sadly disappointed in my expectations. Although my example had failed to rouse the torpid spirit of my own countrymen, it opened the eyes of other nations whose laws are better calculated to support and encourage adventurers in this branch of trade; for the Fishing Company of Altona, who have about thirty large busses, and the Herring Company of Emden, in Hanover, who have probably more, sent their whole fleets to sea in the month of May. During that month and the greater part of June, it will be recollected that the wind blew incessantly from W. N. W. and N. N. W., and the drought was so great as to be severely felt in every part of the United Kingdom. Several of these busses suffered so severely that they were forced to put back in distress, and the others must, in general, have sustained less or more damage in their sails and rigging. Nevertheless they succeeded in reaching the North coast of Scotland, where they were enabled to fish in smooth water, under the lee of the land. With me the case was very different; I was on a lee-shore, exposed to all the severity of the weather, where the swell from the Atlantic was so great that it was in general impossible to cast a net with any degree of safety; while, from the causes which will afterwards be explained, it was altogether improbable that I

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could expect to get herrings either in quantity or quality equal to my opponents. The consequence was, that a large buss belonging to the Altona Company arrived at Hamburgh with a cargo of excellent herrings on the 27th of June, the earliest shipment, I am told, that ever was made to that port; while a buss belonging to the Hanoverian Company followed her on the 2nd of July, with another cargo, *eight days* before the Dutch, and *three days* before my first shipment reached that port. Thus the market for early herrings was unfortunately pre-occupied; and retailers and fishmongers, many of whom are individually interested by acting as agents for the Dutch and other foreign busses, having been supplied before the arrival of my parcel, endeavoured by every means in their power to turn the circumstance to the advantage of their constituents. My herrings, as I have observed, were inferior in point of intrinsic quality to any I had ever seen (they were of the small maatje species), dry, lean, and not juicy; yet, under all these disadvantages, some of them sold as high as 150 marks Banco per barrel. My second and third shipments were, no doubt, much superior, for the herrings improved daily after it began to rain; but by this time the market for early herrings was fully supplied, and great prices could not be expected. I got about from 2*l.* 10*s.* to 3*l.* 10*s.* for the last of my herrings, but the first Scotch herrings from Caithness, cured in the usual way, with Liverpool salt and unassorted, did not average 25*s.* per barrel.

During the months of July and August, the Dutch, Danes, and Hanoverians, made considerable importations to Hamburgh, and the price of common Scotch salted herrings fell to 16*s.* and 17*s.* per barrel! But this prodigious fall, which has been the ruin of many individuals, was not to be attributed altogether to the importations of foreign-cured herrings, but to the fallacy of a too generally received opinion, that by *glutting* Hamburgh *with an inferior article*, we shall be able to undersell the Dutch, and force them to abandon the German market!

The quantity of Scotch salted herrings exported to Hamburgh during the last two years was in due proportion with the immense preparations made at all the fishing stations in the country. The consequences, however, have been ruinous; and although the *extent* of the mischief is not yet known, still the number of bankruptcies that have taken place among our coopers in this part of the United Kingdom, who are generally in the habit of salting great quantities of herrings, without any regard to quality or cure, is truly lamentable. These were in general men of capital and credit, who looked not to such profit as might have been derived from more judicious management, but aimed solely at receiving the government bounty of 4*s*. per barrel, which is nearly equal to 20 per cent on their advances in the way in which they cure herrings, and which on a few thousand barrels, amounts to a very large sum. But the mischief was not confined to the families and friends of wealthy speculators, it extended itself to a quarter where its operations were severely felt by many a poor industrious individual; for the masses of Scotch herrings that arrived in Hamburgh in 1820, *after* the market had been supplied by the Dutch, were so great, that no vent could be obtained for them even at *one half* of the intrinsic price; and many thousand barrels, after lying the whole Winter and Spring in cellars, were foolishly put up *along with the new herrings* as they arrived in 1821, which not only injured the sale of the latter, but excited a strong suspicion that the *new were actualty mixed with the old;* and as this malicious report had no doubt been raised and circulated by the agents for foreign-cured herrings, at Hamburgh, there is no doubt that it operated its full effect in favour of their constituents. To this, therefore, and not to foreign importations, was the rapid decline in the Hamburgh market to be attributed.

Those, on the other hand, who had cured a few hundred barrels either for the Baltic or Colonial market, were, by holding them, placed in nearly as bad a situation as the exporters. The unfavourable reports of that market not only reduced the selling price at home, but enabled our colonial merchants to purchase herrings at nearly one third less than they cost the unfortunate curers!

It would be idle to say that such mischiefs may not in future be prevented: for as they originate with the legislature, it will only be necessary, I presume, to point out the cause and suggest the remedy. Unequal as I admit myself to be to such a task, yet a sense of duty to my country prompts me to try it. I have had a good deal of experience. I have spared neither pains nor expense to make myself master of the subject; and as I have no other object in view but the public welfare, I trust that my best endeavours to be useful may, at least, be regarded with indulgence.

I shall first, however, conclude the narrative of my proceedings of last year, with a description of a machine I have tried, and found to be of the most essential service in completing the cure of herrings; and which, I flatter myself, may greatly tend to their preservation in a tropical climate: and as accounting for the scarcity, the dryness, and the poor condition of the herrings in May and June, 1820 and 1821, on the West coast of Scotland, I shall offer a few remarks on their supposed migration, and the actual food of the herring, which has, until now, puzzled all the writers on natural history.

It has always been, and still is, a matter of the greatest difficulty both with the Dutch and British curers, to clear the pickle of the fixed oil; the Dutch have, no doubt, the advantage, by curing all their herrings on board ship, for the motion of the vessel not only keeps the fish continually covered, but naturally causes the oil to rise more rapidly to the top, when the barrel is put on end. But where herrings are caught in boats on the coast, and cured on shore, the oil often adheres to the fish in rising upwards; and when the barrels are too soon laid on the bulge, which is almost always the case, a great proportion of the herrings are destroyed, especially when they are very closely packed together and laid flatly, instead of being carefully placed on their backs, with the belly upwards. The only method hitherto adopted by the Dutch and British, is to skim off what oil appears on the top, with a round tin plate, as often as may be convenient; and although the Hollanders are much more careful than our own countrymen, in this respect, yet in re-packing on their arrival in Holland, they often find it necessary to throw aside a considerable number that are *rancid in the head:* for one herring affected in this way soon injures the others with which it comes in contact; but as the practice of excluding such herrings forms no part of the British system, even when fish are re-packed for the West-India market, it may easily be figured in what state of perfection they can possibly be, even in the short period of six months from the time of their being first headed up.

In the last paper I had the honour of transmitting to the Society, I particularly detailed the way in which I pickled the gut, gills, and bloody part of the herring. The difficulty I found in clearing this pickle of oil, first suggested the idea of using a brush made of goose quills, instead of a tin plate;

for when the cask was full, I could brush off the oil in an instant with the former, while it required frequent applications of the latter, to clear the top of the barrel even imperfectly; and as the operation behoved to be repeated at least eight or ten times before the pickle was cleared, I soon found the benefit of the goose-quill brush, for the use of it not only saved much time, but did the thing completely in four repetitions.

Anxious, however, to try the experiment on a new plan, and in such way as might afford definitive proofs of its efficacy, I caused my cooper to make a large iron-bound vat, capable of containing about four hundred gallons, and insert a wooden stop-cock about six inches from the bottom, into which was poured the pickle from the gills, &c., as we collected it; and in place of simply filling up the barrels of herring, after the priming was completed, I caused the people to pack them into new barrels, and throw the pickle, out of which they were taken, into the large vat, until they made it quite full. It was then stirred round with a pole, and allowed to stand for about an hour, until the top was completely covered with oil; and this being removed with the brush, the operation being repeated as the oil appeared, the pickle was drawn off gradually by the stop-cock below, and poured into the barrels of re-packed herrings in the most pure and perfect state.

Simple as this invention may appear to be, it will nevertheless be acknowledged by every one who may try it, to be one of the greatest improvements that has been made for many years in the practice of curing herrings. I am sorry it is not in my power to make the experiment on mackarel, as they are seldom taken in sufficient quantity on this coast; but I am satisfied, that were this method to be adopted *in curing* *mackarel*, very great benefit might be expected to result from it.

Before taking leave of this part of the subject, however, I must observe, that during excessive heat in Summer, and when under priming, or even after it, the barrels have been exposed to the noon-day Sun, the pickle of early fat herrings is very apt to become glutinous and ropy; and if not attended to in time, will soon become sour and pungent. When this occurs, the barrels should be immediately removed to a damp cellar, and the herrings taken out. Two pretty close sieves of horse hair (one a little below the other) should be suspended with cords within the mouth of the barrel, and the pickle out of which the fish are taken, gently poured through them for several times; but the sieves must be repeatedly cleared of the slimy matter which adheres to them; and the pickle will then be improved. Before re-packing the herrings, however, they should be carefully washed in a *tub of the pickle*, into which a small quantity *of herring roes* have been previously bruised; and a little fresh salt, finely pounded, should be used in re-packing them, before pouring in the pickle. This treatment will completely remove the evil.

If, on the other hand, the pickle has become inviscated by the introduction of ox-blood, which is sometimes used by herring curers, I know of no method by which it can be restored: this injudicious practice ought to be entirely abolished.

Migration and Food of the Herring.

It is generally believed that after the great shoals of herrings disappear on the east and west coasts of Great Britain, they retire to some high northern latitude, as they have been observed in great quantities to the north-west of the Shetland Islands, during the Spring months, *as if returning* to their former haunts. But if this hypothesis were correct, they must also have been seen, in their passage *to* the northern ocean, in the bays of Iceland, or even on the coast of Greenland. Our oldest whalers declare that herrings were never seen on that coast; and on examining the history of Iceland* I find that herrings never formed any part of the fishery of that island. I have also conversed with gentlemen from North Fœroe, who assure me that even there herrings were never perceived.

It is observed by all fishermen, that during strong northern or eastern winds the herrings retreat into the deeps; but during mild showery weather and southerly winds they appear in shoaler water and approach the shores; and that in some bays and arms of the sea, they are not only seen but taken during the whole of the Winter and Spring.

Herrings, like all other fishes, are liable to migrations at certain seasons; and, in common with other creatures, have their periods of maturity: they migrate for two reasons, it is said—in quest of food, and for the purpose of propagation. But how these are to be answered in a high northern latitude seems altogether inconsistent with the nature of the fish, for when they make their *first appearance from the deep*, in the early part of Summer, they are without milt and roe, and generally lean and poor; but as the Summer advances they increase in size, the milt and roe become large, they spawn in August and September, and their progeny are seen in myriads about the headlands, arms of the sea, and bays which they have left.

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* Island i det Attenaar hundrede. af. C. F. Stephensen, Copenhag. 4to. 1807.

It is supposed by some naturalists that the herrings return in *one* immense shoal from the Northern Ocean, about the beginning of June. On approaching the isles of Orkney and Shetland they separate, it is said, into three divisions, one of which passes to the eastward of Shetland and through the Pentland frith, and extends itself from Caithness to the coast of Norfolk—another takes its course to the westward of the Hebrides, and along the west coast of Ireland—and the most considerable division passes betwixt Cape Wrath and the Lewis Islands, through the Minch, and enters the several locks, bays, and arms of the sea on the coast of the West Highlands and frith of Clyde, &c. If this supposition was well-founded, the herrings caught on both sides of the island, as forming part of this great shoal, would naturally appear the same in shape, size, and quality; but so far from this being the case, it will be found that they consist of many distinct tribes and families, all differing in some respect or other and varying in size and appearance. To prove this, it will only be necessary to place a herring, such as I had the honour of transmitting to the Society, on a plate along with a herring which has been caught and cured at the same period, on any part of the east or north-east coast. Not only will they appear to differ materially in shape and in the formation of the fins, but the scales of the east-coast herring will be found to be, at least, one third larger than the other, and perhaps as large again, consequently, the number of scales on the west-coast herrings is considerably greater than on those of the east; the size of the latter frequently exceeds that of the former, especially at the spawning season. The head and shoulder of the west-coast herring is somewhat similar in shape to the pilchard, and the quality is so very superior, that in Edinburgh, where both are brought to market in a salted state, when the Caithness, or east-coast herrings, only bring a guinea or twenty-five shillings per barrel, those of Lochfine, or from the west-coast, are readily sold at two guineas.

A shoal of herrings generally makes its appearance off the Loffoden Isles, on the coast of Norway, in the month of July, which passes along, it is supposed, to the southward, where they are taken in immense quantities in the rivers, or rather friths of Drontheim and Bergen, during the whole of the Autumn and Winter. I have seen and examined several samples of these herrings: those taken near the North Cape appear to be of a species entirely different from those met with on any part of the British coast; they contain an immense quantity of fixed oil, are larger by two or three inches than our largest herrings, and in the texture of the fish, and flavour, resemble the gasperoe, a species of herring taken in the river St. John in Nova Scotia. The North-Cape herring differs from all others in the following particulars: the head is shorter in proportion, and more flat and round; the eyes less prominent, the dorsal fin is broader, and the scales are nearly as large as those of the salmon. The herrings, however, taken near Christian Sound in the district of Drontheim, and also in the frith of Bergen, differ materially, both in size and shape, and are of very superior quality. The North-Cape herrings have a harsh disagreeable flavour, while those caught in the frith of Bergen are equal in flavour to our best Caithness herrings, and during the last winter brought as high price in the Baltic ports.

Now, if any credit is to be given to the theory of the herrings coming in one great shoal from a high northern latitude and branching off into several divisions, as they are intercepted in their course southward by the mainland of Scotland, the Hebrides, and the Orkney and Shetland Islands, it may naturally be inferred that the division which is said to pass to the eastward of Shetland, in the beginning of June, should be that which appears off the North Cape in June and July, and along the coast of Norway during the Summer, and as being of the same great family, that there could be nothing in their shape or quality to indicate a difference of species.

Independently, however, of dissimilitude in shape, size, and flavour, there is a striking peculiarity in the natural habits of the Norway Summer herring, which distinctly places the disparity of species beyond all doubt: when the summer herrings make their *first* appearance off *any part* of the coast of Scotland they are small in size, but grow larger as the season advances; whereas, the largest herrings are first seen off the Loffoden Isles in June and July, and the better and less-sized herrings are never caught off Christian Sound, in the frith of Drontheim, or Bergen frith, before the months of August or September,

No sooner do the summer herrings disappear on the Norway coast than they are succeeded by great shoals of Winter herrings, which continue in the friths and bays of that country until the month of April; and the same species of herring is also found on the coast of Jutland, the Elbe and Wezer, and even in the Zúyder Zee.

In the month of November a shoal of herrings enters the frith of Forth in Scotland, and generally remains until the month of March. These herrings appear to be of a similar species to those caught on the coast of Norway, Denmark, and Holland. About twenty-six years ago the fishery in the Forth was carried on to an immense extent, and many thousand barrels of thes eWinter herrings were salted for the West-

India market. A similar fishing was also carried on at Kessock, near the head of the Murray frith: now, although these herrings appeared at both places about the same time of the year, they differed materially in shape, size, and flavour.

About the same period an extensive herring fishery was carried on at Wingoe Sound, and at other places on the coast Sweden; and the herrings caught there being deemed of a quality better suited to the West-India market than our own Winter herrings, were frequently purchased by British merchants and exported to the colonies. Owing, it is thought, to the number of men of war and other ships that lay in Wingoe Sound during the late war, and the frequent firing of cannon, the herrings that used to frequent that coast in Winter have entirely abandoned it, at least no other reason has hitherto been assigned for their disappearance. As the shoals of Winter herrings are now, however, much more extensive on the coast of Norway (particularly near Fahrsund) than they were known to be during the Swedish fishery, it may at least be presumed that the same tribe or family has migrated from the one coast to the other.

Although the same reason will not apply to the fishery in the frith of Forth, yet it is a well-known fact, that since the year 1806 the shoal which annually appeared in that arm of the sea in Winter has gradually decreased and dwindled to nothing, for the whole quantity taken during last Winter did not exceed an hundred barrels. I examined them carefully, both in November, December, and January, and found them to be unfit for curing—they were all carried to market in a fresh state.

When that fishery was at its height, it was generally remarked that the herrings first appeared on the coast of Corn-

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wall, in England, mixed with pilchards, where there is a considerable annual fishery of the latter. Their progress along the east coast of England was distinctly traced; great quantities were taken off the coast of Yorkshire and Northumberland a few days previous to their appearance in the frith of Forth; and when the shoal did enter that *frith from the southward*, they were so intermixed with pilchards that they were separated by the curers—the herrings were salted in the usual way, but the pilchards were smoaked. Previous to that period the pilchard was unknown in Scotland, and for the last twelve years none of the species have been seen on our coast.

Some years ago the shoal of Winter herrings in the frith of Forth was succeeded by shoals of a different genus, called by our fishermen garvies; and this was also the case at Kessock in the Murray frith; they appeared frequently in such immense quantities that the peasants laid them on the land for manure. It is generally believed that the sprat is a distinct species of the herring, but I doubt whether the garvie found in the Scotch firths is the same with the Clupea Sprattus of Linnæus. Sometimes the garvies appeared before the shoal of Winter herrings in the frith of Forth, and sometimes after them; but it was remarked by all the fishermen, that all the herrings or garvies which were taken in the bay of Inverkeithing, or to the westward, where the water is brackish, were much more lank and less in size than those which were caught at the same period, a few miles to the eastward.

The Clupea Sprattus of Linnæus appears in great shoals on the coast of Norway in the months of August and September; they are much less in size than our garvie, and contain more oil. The Norwegians pickle them in small

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kegs, and export them under the name of anchovies: they are very neatly put up, and being judiciously spiced, bring a good price in many of the chief towns of Russia, Prussia, and Germany. (I have written to Norway for one of these kegs, and if it arrives in time it shall accompany this paper).

Last year I had an opportunity of examining these Norwegian anchovies, and comparing them with the young Gipsey herrings which are found in immense quantities in this frith during the months of June, July, and August; and I could not perceive the smallest difference. The largest Norwegian anchovies, and young herrings of equal length, had each forty-four vertebræ, and that roughness of the breast, peculiar to the sprat and which distinguishes it from the young Summer herring, was the same in both. I am thus inclined to think that the sprat is not a distinct species, but merely the Gipsey herring which has been spawned during Winter.

Be this as it may, I intend to try the experiment of curing these young herrings in the Norwegian manner, as soon as I can discover the process employed for this purpose. I see no reason why we may not have British anchovies; and I flatter myself they would find a ready market in every large city in the kingdom. When I try the experiment I shall send a keg to the Society.

Although it is evident that there are several species of the herring (Linnæus enumerates ten in his *Systema Naturæ*, and there are probably more) and although all these may, in some particulars, differ from one another, still it must be presumed that the aliment on which the whole subsists is the same. Many instances might be adduced of herrings choosing one place instead of another for their Summer and Winter residence—of appearing there regularly for many seasons, and of abandoning these haunts, and again revisiting them after a period of years. These desultory habits I attribute to the supply or scarcity of food they find at these places, and the nature of the weather, and temperature of the atmosphere at the time they emerge from the deep.

It is admitted on all hands, that the herrings enter the different bays and arms of the sea which indent both sides of the island, for the purpose of depositing their spawn; indeed, the fact is clearly proved by the myriads of fry which show themselves shortly afterwards in all the little inlets of the rocks where the water is smooth. As this fry is first perceived where the bottom is covered with the alga marina; or, where the rocks which jut out into the sea are clad with the common fucus, or kelp weed, it may naturally be inferred that the spawn is deposited in the gravel under these marine plants, which serve to protect it as well from the convulsions of the ocean, as from being destroyed by other fishes.

If I am right in this hypothesis, it must follow as a natural consequence, that the spawn of the herring on being vivified, draws its subsistence from some attenuated aliment adhering to, or connected with, these marine plants: for it would be inconsistent with the economy of nature to suppose that the herring would deposit its spawn in a sitnation where the fry could not be supported—but, on the contrary, that it would carefully select those places, where, on emerging from the deep, it had itself found the greatest quantity of food.

It is said that shoals of herrings have been seen on the great bank, several leagues to the North West of Shetland, with their heads to the South East, as if making for the coast; but as no herrings were ever taken to the North West of Shetland, or even of the mainland, it is difficult to say in what state they were, when so seen, or in what state they are in the month of April, before they appear off the coast; indeed, their appearance at such a distance from the land may have arisen from some unknown cause, which may not again produce the same effect. But I am satisfied that the herrings *which first appear* either off the East or West coast in the beginning of May (for I have carefully examined them) *are lank and spare;* but in the course of ten or twelve days become plump and round; and after the middle of July the milt and roe increase rapidly.

In the months of June and July last, I had many striking proofs of this fact; and being convinced that the poorness of the herring was owing to the great drought of the season, I resolved to open the stomachs of a number of the fish, and ascertain, if possible, on what they subsisted. In trying the experiment with those that were brought in a boat from some distance, I frequently found nothing, and at other times, a kind of slimy substance; but, as it occurred to me that this might be owing to the strong digestive powers of the fish, which speedily converts into chyle the food it has swallowed, I saw the necessity of cutting up the fish the moment it was taken from the water: for in man, as well as in animals, the power of the gastric juice is known to continue after death, so as not only to liquify the contents of the stomach, but even to corrode the stomach itself. I therefore pulled with a small boat close in shore, where the rocks were profusely covered with alga and kelp weed, on the one side of a little sandy bay, where the herrings appeared in quantities after a shower, crowding to the surface and leaping at flies; and throwing over two or three lines with unbated hooks, drew up several full-grown herrings. These were instantly cut up and their stomachs examined; in some, I found a soft substance, almost like the milt of a herring, which became somewhat firmer when exposed to the air. In others this substance appeared to be less digested; and the claws or feelers of small crustacea were, I thought, discernible. I persevered, and found young prawns and shrimps entire, a few of which were so complete that I preserved them in a little herring pickle, and afterwards in a small phial with spirits, which I now send along with this paper. I also found young herrings in the stomachs of many; but this frequently occurs. Satisfied, however, that the substance I first perceived was different from all these, I continued my exertions for some succeeding days, in the same manner, and still found the same substance most prevalent, but in such a mutilated state that I almost despaired of success; at length a fisherman having drawn his net, at a very short distance from me, in which was a very large herring, I was fortunate enough to get hold of it immediately; and on cutting it up, found the stomach actually crammed with the same substance. I spread this out on a board, and on examining it with a glass, was enabled to trace the figure of the animal, for some of the claws were perceptible. But it was greatly under the size of any of that species I had ever seen, and had evidently been swallowed when divested of its shell.

The fish to which I allude is the only species of the pagurus or soldier-crab, found in our seas; it is considered by the vulgar as the young of the common lobster; but all our fishermen know that it never exceeds six inches in length from the tip of the great claw to the tail. All the species are parasitical, inhabiting the empty cavities of turbinated shells, the animals of which they are supposed to attack and devour, to gain possession of their shell. Like other crustaceous fish they cast their shell; they also change their habitation with their growth, first occupying the shells of the periwinkle or trochus, then, perhaps, a nerite as large as a walnut, and after that a whelk. The tail is naked and slender, being covered only with a skin of very delicate texture; but it is furnished at the extremity with two or three hooks, by means of which it secures itself to the shell which it makes choice of. Although this species of the soldier-crab is not noticed by Buffon and many other modern naturalists, it was not unknown to the ancients: Aristotle has very accurately described it under the name *καρκινιον*. And a favourite old German author thus describes it, "Ein kleiner meerkrab: Ein meerspinnle, wonet in schnek enschalen im meer, inn den schalen et licher labenden schnecken oder muscheln, ein muschelgast." And this description is illustrated by a very accurate engraving.*

I have often heard the most experienced fishers express their astonishment at the comparative small quantity of lobsters and other crustaceous shell-fish, found in our bays, considering the very prolific nature of these creatures. They spawn in the Spring and Autumn; and the quantity they deposit, must, at least, be quadruple to that of any other kind of fish. Of this every person will be convinced on examining the roe of the lobster, of the different species of the crab, and of the shrimp, for in this and other respects, unless it be the disparity of size, there is little difference in their habits. The spawn of the lobster is like a cluster of small peas, which they carry under their tail until it is ripe for exclusion, which generally takes place in May and September, at the former of which periods it is known to change its shell. Although the spawn both of the lobster and crab is deposited at the bottom, it is observed to emerge and float on the surface, in mild, warm, showery weather, where it is vivified by the heat of the Sun: and in small sandy bays and inlets of the sea the fry are perceived in countless myriads. Whenever the heat is succeeded by cold, however, not only does the spawn disappear, but the young shell-fish sink to the bottom, or seek for refuge among the common fucus and alga, which covers the deep shelving of the sub-marine rocks.

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* Conrad Gesner Icones Animalium aquatilium in Mari, &c. lib. 3. De Crustatis, ordo XIV, p. 209, Heidelberg 1560, fol.

In the Lewis and several of the Western Islands, where small shell-fish of every kind is in very great abundance, and which, indeed, about a century ago, constituted a principal part of the food of the inhabitants, it has always been remarked, that when the wind is south or south-west, and showery, great quantities of these creatures are caught at the ebbing of the tide; but whenever the wind veers round to the northward, they sink into the deep, or burrow in the sand, like sand-eels, while the larger kind disappear entirely. When this happens previous to any change, it is regarded by the inhabitants as a certain indication of northerly wind.

If, therefore, crustaceous animals and their spawn be the food of the herring, which, I think, can hardly be questioned, the scarcity and poorness of the latter, on the West coast of Scotland, during the months of May and June 1821, is well accounted for.

If crustaceous animals be not the food of the herring, how does it happen that, on emerging from the deep, they should flock in shoals to those places *only* where they are to be found—where they deposit their spawn, and where their fry are seen in myriads?

The lobster is known to change its shell once a year; and when in a state of nudity, is devoured by the cod, ling, saith, and other large fishes. It may therefore be inferred, that the smaller genera of the crustaceous tribe do the same thing:

for the different soldier-crabs which I found in the stomachs of the herrings, although covered with a kind of skin or integument, had no shell; and thus, while the full grown herrings feed on these and other shell-fish, their progeny are subsisted by the spawn and fry of these creatures with which the wâter teems, and with which the alga marina and other plants are covered.

As the greatest profusion of lobsters and other shell-fish are found in the bays of Orkney and Shetland, of the Western Islands, and of the Northern points of the mainland, it is no way astonishing that the herrings should, on emerging from the deep when the weather becomes warm, be seen *first* at these places.

Shortly before the lobster fishery commences in Orkney and Shetland, the herrings, it is said, appear in great quantities to the northward of these islands, and also in the Minch, where a singular substance is seen floating on the surface; in all probability the spawn of the lobster, which may be carried in that direction by the tides, and the operation of a southerly wind. In Norway, lobsters are got in great abundance in the neighbourhood of Fahrsund, from whence the spawn may, by the same natural means, extend to the Loffoden Isles and North Cape; but it is remarked, that the herrings generally spawn near Fahrsund, where, at least, their fry are seen in great quantities, and where the shoal of sprats and winter herrings make their first appearance.

A learned and ingenious writer on natural history, in speaking of this floating substance, thus expresses himself: "The different accounts given me by skilful mariners, who were also conversant in the herring-fishery, agreed in this, that the substance consists of separate globules of a *roundish figure*, and of the *size of a pea*, resembles blubber, covers the surface of the sea to a great extent, and makes it to appear as if covered with oil; that the herrings are known to feed upon it; and that it has been observed in great profusion to the north-west of Shetland, where the herring-shoal existed at the same time. If this account, given me by persons of observation and veracity, is admitted, we need be no longer surprised at the retreat of the herrings to these tracts of the Northern sea, nor at their return in a full-fed and fat condition. The substance here intimated is probably a small species of medusa, or some similar marine animal, which is not as yet known to naturalists."

Although he is incorrect in his idea of the medusa, which is, in fact, the sea-nettle, and is always found of a bright red colour; yet his description of the floating substance corresponds so exactly with the spawn of the lobster, that there cannot, I think, remain a doubt on the subject.

That the flesh of the herring flavours more of shell-fish than any other, is often remarked, particularly if boiled or roasted; and when eaten raw, with vinegar, it is acknowledged to be an excellent substitute for the oyster. This flavour in the herring, however, and even the richness of the herring itself, must depend greatly on the state of the coast where it is taken. If, after feeding on the floating spawn to the northward, the weather be such as to fill the bays and inlets with a profusion of small shell-fish, the herring must improve on entering them. If these creatures, on the contrary, have burrowed in the sand, or sought refuge from the cold among marine plants, the herrings must, necessarily, as I found them in May and June last, be dry and poor. To the immense quantity of small shell-fish that are in general found on the West coast of Scotland, may be attributed the superior quality and flavour of the herrings, and to the many bays and arms of the sea which indent that part of the coast, where, in smooth water, these shell-fish become a more easy prey to the herring; and which, I think, has the effect of rendering the flesh of those caught in Lochfine and that neighbourhood, more firm and less fibrous than the herrings which are taken off Caithness and the whole of the East coast, where the water is deeper in shore, and where small shell-fish are less abundant.

When the herring fry are observed to leave our bays and lochs, in the beginning of Summer, the shoal moves so very slowly that it would require a period of years to complete their journey to the Frozen Ocean. My opinion is, that they retire into the deep, but at no great distance from the shore, where they remain at the bottom in a kind of torpid state during the Winter, from which situation they are recalled by the Spring and the heat of Summer. Were not this the case, we should see them much earlier than we do with a long prevalence of north or north-west winds, which would naturally facilitate their return from a high northern latitude. But as they invariably make their appearance with a south or south-east wind *much sooner* than when it blows from the opposite point, it is altogether impossible that they could buffet the mountain billows of the ocean, and traverse such an immense extent of sea in the course of a few days.

Of herrings as of all other fishes, I imagine there are many distinct tribes and families, who have each their separate place of resort, both in Winter and Summer; and that their qualities and properties are as different as the places they frequent: for one herring-shoal has frequently been seen to pass another, with much regularity, and without the least commixture. They appear in this respect to be similar to the salmon: like them they form gregarious shoals or associa-

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tions, into which only those are admitted who are of the same family. Although the herring seeks no mixture of salt and fresh water, yet they approach the coast for the same purpose that the salmon emerges from the deep: he enters his native river, and the herring his loch or bay, and having answered purposes of nature, both retire again to the deep with the same regularity and order in which they left it.

Epitome of the Statutes of Holland by which their Herring-Fishery is regulated.

Were it not to swell this paper to a great length, I would have given a history of this lucrative branch of trade, marked the periods of its rise and decline, and explained the causes which produced them; but I shall reserve that branch of the subject for a future purpose, and without going into any long discussion, content myself with drawing a parallel betwixt the laws of Holland and Great Britain, so as to point out their disparity and the glaring errors and absurdities of the latter, which have a tendency not only to check all enterprise and improvement, but to prevent the British fishery from attaining that character and consequence which it ought to possess over that of Holland or any other country.

The Dutch busses and doggers sail from Holland *in a fleet*, early in June, shaping their course for Brassey Sound, in Shetland, under the protection of an armed ship. This vessel was formerly styled in their old statutes an hospital-ship, as the principal duty she has to perform is that of receiving on board such of the fishers as fall sick or meet with any accident during the season; and her accommodations are such as to afford them every comfort. The fleet is also

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accompanied by ten or twelve fast-sailing vessels, called jagers, which run to Holland and Hamburgh with the early herrings during the Jacht-tyd, *i. e.* from the 24th June to the 15th July inclusive; but after that period every buss and dogger must carry home her own cargo, although they are not permitted *to enter the ports of Holland before the* 19*th of that month* (in order that all the early herrings may be disposed of at as high a price as possible) unless they have expended their materials, and filled the whole of the barrels they carried out, under a penalty of six thousand guilders: and the whole fleet are prohibited from casting their nets before the 24th of June, or after the 31st of December under the like penalty.

The first jager sails to Vlaardingen, and the second to Hamburgh. The herrings shipped by these vessels are neither bung-packed nor re-packed, but arrive in their original state, or, as it is termed in Scotland, in a green state;* but those sent by the other jagers must, after lying *one night* in pickle, be bung-packed and filled up.

Herrings caught after the Jacht-tyd must lie *ten days* in pickle before they can be branded or sold on arrival in Holland; and to ascertain this the master of each buss is bound to mark between the neck and belly hoop of each barrel, the day on which the herrings were taken, under a penalty of three hundred guilders; and in default of payment confinement on bread and water for a month: The master must also put his own private mark on each barrel under a small penalty.

All herrings caught before sun-rise must be gutted, assorted, and packed before sun-set the same day, or thrown overboard, with the exception after-mentioned.

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* Orders voor de Stuurlieden der schepen, begrepen in de Haring Jagerij van Vlaardingen en Maas-sluis.—Rotterdam, 1817, fol.

Those who are employed on board the busses to lay the herrings must put their mark a hand-breadth under the chime; and also betwixt the neck and belly hoop outside; and if this is neglected, or, on arrival in Holland the herrings are found to be improperly laid, that is to say, one layer not crossing the other, and packed sideways in place of having the belly upwards, such layers or packers are liable to a penalty of 25 guilders for each barrel.

The mate of every buss or dogger convicted of *Bloemlaagen*, that is to say, picking out the best herrings and packing them in the upper layers of the cask, while the middle is found to contain broken herrings, those bit by sea-dogs, or otherwise unfit for market, subjects himself to the like penalty, and also to corporal punishment, according to circumstances.

The masters are *strictly enjoined* to ASSORT their herrings properly, and to pack each kind by itself in separate barrels; namely FULL HERRINGS with FULL HERRINGS (*i. e.* full-grown herrings with milt and roe), MAATJES with MAATJES (*i. e.* the early herrings with small milt only), and YLEN with YLEN (*i. e.* a long slender fish); and also to keep the HOMZICKEN distinct from the KUITZICKEN (*i. e.* herrings full of milt and roe about to spawn—milt-sick and roe-sick): On no account must *full* be mixed with *maatjes* or *ylen*; on the contrary, the masters are bound to draw with their marking knives two gordings or grooves betwixt the neck and belly hoops on each end of the barrels containing *maatjes*, and one serpentine groove or gording round the bulge of the barrel containing *ylen* herring. Masters or mates convicted of offering *mixed* for *assorted* herrings, or falsely marking the barrels, are on the first transgression to be dismissed from their service, and rendered incapable of being again employed, as no sea-brief or passport can again be granted to them for the fishery.

When it happens, however, that towards the close of the season an extraordinary shoal of herrings encircles the buss, and it is found impracticable to assort them all properly, the master is, in that case, permitted to salt the remainder *without assorting* them; but, on his arrival in Holland, he must, with two of his crew make oath to the fact; and the herrings so salted shall not only be *specially marked by him*, but shall be *reported inwards* as UNASSORTED or REFUSAL herrings, under which latter denomination only can such herrings be branded by the Keurmeester (inspecting officer of the fishery), or exposed to sale.

The mates are bound to mark all the barrels containing herrings which are cured with *boiled salt* each day as they cure them and before they stow them in the hold in the following manner;—The *Vrouwtjes haring* with V, *i. e.* herring taken after St. Margaret's day, or from the 21st to the 25th July; the *Jacobi haring* with J, being taken the day after St. James's day, or from the 26th July to the 24th August; the *Bartholomei haring* with B as taken the day after St. Bartholomew's day, or from the 25th August to the 14th September; and the *Kruis haring* with a + or those taken after the 14th September, under the penalty of three guilders for each unmarked barrel. Besides, each mate is bound to appear with two of the crew and make oath before the town-clerk of the port where the vessel arrives, that these herrings were separately marked, as above directed, at sea before they were stowed in the hold.

All buss-masters, after expiry of the jacht-tyd (after the 15th July) are prohibited from giving any herrings to jagers, under the penalty of six hundred guilders, dismissal from the fishery, and, according to circumstances, corporal punishment.

And they are under the same penalty restricted from landing and disposing of their herrings in a foreign port before they are brought into Holland, inspected and passed and branded by sworn Keurmeesters, and the proper certificates to that effect granted. Even although forced by stress of weather or during the time of war to enter a foreign port, they are prohibited from selling any unpassed or unbranded herrings, under the same penalty, besides forfeiture of the herrings so disposed of, or at least the value thereof, according to the market price at home.

All buss-masters on obtaining a passport or sea-brief for the herring-fishery are furnished with a copy of the placard or ordonnance regulating that fishery. and must promise, on oath, to perform the various instructions which it contains, before the vessel can be cleared for sea; and on returning from the fishery they must appear with two of their crew (the two chief officers), and make oath before the town-clerk of the port, not only as to the quantity of herrings they may have taken, but must also produce a regular journal of their proceedings from the day of sailing unto that of their arrival, specifying the *different sorts* of herrings they have on board, and the dates of their several markings; and should it be discovered that any buss-master has made a false journal, or given a false account of his cargo, he is forthwith prosecuted for perjury and rendered infamous.

All masters and mates are strictly prohibited from rousing herrings (sprinkling them with salt in bulk before gutting them), unless in the case of a great take at the conclusion of the season, when they are permitted to bring them home in *that state* for the purpose of being *smoaked for red herrings;* or during a severe storm by which the crew are prevented from curing them in terms of the placard: In the former instance, however, they must previously have the greater part or nearly all their cargo stowed; and the master and two of his crew must, on arrival, account on oath for either occurrence.

All herrings which in the re-packing, whether at sea or after arrival in Holland, require to be heightened (filled up) must only be filled up *with herrings of the same night's taking and assortment;* and no barrels must, on any account, be filled up *with herrings of a later date,* far less with milt-sick, roe-sick, or spent fish: And the sworn Keurmeesters are strictly enjoined to give the fullest effect to this regulation. All barrels which may be broken to fill up others, may be turned over into half barrels or kegs, and branded.

Keurmeesters are directed to pass no unwholesome or ill-cured herrings; but, on the contrary, to cause them to be thrown into the water on being landed; and to levy a fine of six guilders for each barrel.

All the fine salt wrackke (foul) herrings, whether packed in barrels, half barrels, or kegs, shall only be filled up with herrings of *the same take and description;* and must, before they can be exposed to sale be branded thus;—The Jacobi Wrackke, W. J.; the Bartholomei Wrackke, W. B.; and the Kruis Wrackke, W + and that over and above the local brand.

Of coarse salt wrackke, as sea-stock, intended for the Russian market, thirteen barrels shall be packed into twelve; but *shall not be exported to the Elbe or Wezer, under forfeiture of the herrings,* and *a penalty of one hundred guilders for each barrel besides corporal punishment.* Those sent to Hamburgh, Bremen, and the contiguous ports, must be passed, branded, and approved of by Keurmeesters, as perfect in *quality, cure,* and *assortment,* whether full grown, maatjes, or ylen: *Every twelve barrels* to be packed from *fourteen barrels of sea-stock,* and the barrels bound with sixteen hoops. Herrings of the latter description shall be branded with the *great branding iron,* but those first described (thirteen to twelve) with the date iron; and the ylen herring, whether packed in barrels, half barrels, or kegs, must be branded *with the words*, "*Ylen Herring*," under the penalty of corporal punishment.

Any buss-master convicted of giving showing or lending to any foreigner the printed regulations for the fishery with which he is furnished, for the purpose of instructing such foreigner, shall be adjudged guilty of perjury, forfeit six hundred guilders and be otherways punished.

Of the Salt.

All herrings caught by the busses at sea, may and shall be cured only with Spanish and Portugal salt, and with salt which is boiled from salt within this republic.*

All herrings caught after St. James's or Bartholomew's day shall be cured with salt which has been boiled from salt, pursuant to contract entered into with the city of Cologne.†

No white fine salt shall be received or passed, unless accompanied with a certificate from the maker; and taking an oath before they use it, that the salt is not changed after receiving it on board, on forfeiture of the salt or the value thereof; and if convicted of perjury to be punished in terms of the said contract with the city of Cologne.‡

All persons are interdicted from using English or French salt for the cure of herrings, whether from Liverpool, Senters, Olderdome, Borcus, St. Martin, Bruarvart, South of France, or Isle de May. All herrings cured with either of these salts are declared unmarketable and shall be confiscated.

All the herrings which are caught after the 24th of June, whether full, maatjes, or ylen, shall be salted with Spanish or Portugal salt only; and such herrings shall be called and branded coarse salt herrings: but with salt which is boiled from salt within this republic shall no other herrings be cured, than *prime full grown herrings*, caught *after* the 20th July; which herrings shall be called and branded fine salt herrings, and of which there are four kinds, namely, Vrouwtje, Jacobi, Bartholomei and Kruis herring, under the penalty of twenty-five guilders per barrel, to be recovered from the mate contravening this section.*

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* Publicatie van het Uitvoerende Bewind der Bataafsche Republick, 28 June, 1801, § 28.

† Placaat geresumeerd 23rd May, 1749, § 32.

‡ Ibid, § 29.

No buss-master, or other person engaged in the fishery, shall be permitted to ship any salt for that purpose, until the same has been inspected and passed by a sworn Keurmeester, thereto appointed by the local authorities of the port or place where the vessel may then be. Should it be discovered that salt of any description has been shipped without such inspection, a fine of six hundred guilders is levied from the ship's husband or owner thereof.

Casks.

All barrels, half barrels, and kegs, of every description, for the herring fishery, shall be made of well-seasoned oak ONLY; and the staves must be split and not sawed.

Keurmeesters are enjoined to examine strictly all barrels, to reject those that are insufficient or bound with improper hoops; and to amerce the cooper six stuivers for each rejected barrel.

It is recommended to coopers who make barrels for the herring busses to lay the staves for some time in a steep of moss-water; and to fire their barrels with turf (peat) only.

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* Publicatie van het Uitvoerende Bewind der Bataafsche Republick, 28 June, 1801, § 28.

Hoops.

Red hoops only shall be used for herring barrels, half barrels and kegs. All barrels, &c. hooped with *export hoops* shall be rejected, as well as those which are bound with unseasoned hoops. No herring barrels shall be bound with a less number of hoops than as before-mentioned, and such hoops shall be placed in terms of the late regulation of the committee of the fishery.

All casks must be branded and passed by the Keurmeester and his assistants before they can be received on board; and although every cooper is bound to brand his own private mark thereon, yet no cooper shall be permitted to brand them for the fishery—the branding iron shall not even be heated in the cooper's premises.

All barrels, half barrels, and kegs, shall be of the contents specified in the regulations, under penalty of seizure.

Sketch, or Outline of the British-Fishery Laws.

A bounty of 3*l.* per ton shall be paid, annually, to the owner or owners of any whole decked buss, or vessel, of not less than 60 tons burden, being British built, owned, navigated and registered according to law, which shall be fitted out for, and actually employed in the deep-sea British white herring fishery; but such bounty shall not be paid on any number of tons more than 100, although the buss should be of greater burden.

A commissioned officer of the British navy is appointed superintendent of the deep-sea fishing, whose duty is to proceed annually to Brassey Sound in Shetland,—be there on the 15th of June, remain with the vessels employed in that fishery during the season, transmit to the commissioners of the Admiralty, or Fishery-office at Edinburgh, when required, a list of the busses employed, with the number and ages of the men on board of them, distinguishing the capacities in which they respectively act.

Inspectors and other officers appointed by the Treasury to inspect and take account of all herrings landed or exported, and to certify whether the fish are properly salted and packed, *for which purpose* they must have exercised *the trade of a cooper*, and be otherways skilful in this business.

No buss, or vessel entitled to the bounty, unless she have on board *a certain quantity of salt, barrels, netting and men* proportionate to her tonnage, as specified in the act 48, Geo. III.

The owner, or owners, in order to obtain the tonnage bounty, to give notice, in writing, to the officer at the port of outfit, of the name of the buss, the number of men, and the quantity of materials she has on board: and if the officer is satisfied that the regulations have been complied with, he certifies the same on the back of the notice, and one or more of the owners and the master respectively make oath before him, that it is truly their determined purpose that such vessel as then furnished and provided shall forthwith, after license is granted, proceed to Brassey Sound in Shetland, and be there on or before the 22nd day of June (having on board the number of men required) *and shall not wet or shoot her nets before the 24th day of the same month;* and *shall fish for herrings* in the deep, in the manner practised by the Dutch, that is to say, the nets shall be shot from and hauled into the vessel; and the crew shall cure and pack all the herrings they may take. The buss *shall continue fishing* *from the 24th of June until the 15th September;* and on *the owner giving bond, with sufficient sureties* that all requisites have been performed, the officer gives the master a licence *to proceed on his voyage to the rendezvous.*

On arrival at Brassey Sound the superintendant *must search every buss, examine all her nets and stores, and ascertain that she is properly manned.* He *then* grants a certificate, declaring that the buss is entitled to *commence* the deep-sea fishery for the tonnage bounty.

Herrings taken each day to be distinguished by the date being cut with a knife on the outside of the barrel.

The master of every buss must keep a regular journal, in order to be entitled to claim tonnage bounty.

The officer of the fishery at each port to attend the landing of the herrings, and of the salt and barrels which have not been used, out of each buss, and take account thereof and certify the same; which officer transmits the master's oath to the commissioners of the fishery, who, if satisfied, give a debenture to the owner, which is payable by the commissioners of excise, or their collector, at the port where the buss has discharged.

Owners of busses to allow their crew two shillings on each barrel of herrings taken and cured by them.

Another species of fishery is permitted to be carried on by vessels not claiming the tonnage bounty. Some of these are fitted out nearly in the same manner as busses, with nets attached to them, which they can shoot from and haul into the vessel. These, although intended to fish in the open sea, confine their operations to lochs and arms of the sea, particularly on the west coast of Scotland, and frequently purchase the herrings they cure from small boats. They are also subject to the control of a superintendant, in the same way as the deep-sea busses; but they *are not restricted to time*, and may carry home what quantity of herrings they please, only they *must return to the port from whence they cleared, or to some other port or place* where an officer of the fishery is stationed.

No deep-sea buss, on the other hand, must leave the fishery from the 24th of June until the 15th of September, otherways she forfeits her tonnage bounty. To this rule, however, there are two exceptions: namely, if she has completed her cargo (400 barrels), in that case she may run into port, and, after discharging, return to the fishery; or, if forced by stress of weather or loss of her hands to seek a port, she may refit and return to the fishing; but, in both cases, she *must continue to fish* after the 15th of September until the number of days she was absent are made up.

But the great proportion of these vessels carry only salt and barrels, and purchase the herrings fresh from the fishermen, who take them in small boats around them.

In both cases the owner is bound to give notice to an officer of the fishery of his intention, which officer attends, examines the stores, sees them shipped, and grants a certificate to that effect: articles shipped without such notice liable to confiscation.

Barrels to be marked with the dates, as in the deep-sea fishery, to show whether the herrings have been cured, *gutted or ungutted;* and whether gutted by *a knife, or with the fingers!* Masters to keep an account of these particulars, and *of the salt used, the places of curing, quantity put on board every day, and quantity sent into port in any other vessel, or boat.* Such account to be verified on oath before a justice of peace (or fishery officer), and transmitted to such officer, who is to give the master a copy thereof.

Declaration and oath to accompany herrings brought into port in such other vessel, or boat. Herrings and stores to be forfeited if landed before delivery of account, declaration, &c. Commissioners *may waive forfeiture* for errors or omissions not wilful, and *levy a penalty in lieu thereof.*

When salt is kept stored on shore for the purpose of curing such herrings as are caught in small boats, and which, indeed, may be said to be the general method practised in Scotland, notice must be given to an officer of the fishery, an account kept, and marks put on the barrels, as before described. Such herrings cannot be removed, or shipped, or produced for branding, until the curer deliver such account to the officer, and verify it on oath, of which the officer must give him a copy.

All herrings cured in this way, as well as on board of vessels not cleared for the tonnage bounty, if gutted with the knife, and salted and packed within twenty-four hours, are entitled to a bounty of 4*s.*; *if gutted with the fingers* 3*s.* 6*d.*, and, *if ungutted*, 2*s.* per barrel; in all which cases, however, the barrel, if bung-packed, or re-packed with small (Liverpool) salt, must contain, exclusive of salt and brine, two hundred and thirty-five pounds weight of fish at the least; or, if re-packed with great (Liverpool) salt, for exportation, exclusive of salt and brine, two hundred and twelve pounds weight of fish at least.

All herrings, whether cured in a bounty-buss, or other vessel, or on shore, shall not be branded by any officer of the fishery for bounty, unless a space of time not less than *fifteen days* shall have intervened from and after the day when the herrings were originally cured and packed.

No herrings *roused* or *cured in bulk* shall be branded or allowed to be mixed with herrings cured in barrels.

If herrings cured in bulk are afterwards put into barrels, the barrels must be branded with the word "Bulk" in legible letters.

If the refuse of those which are carried home to be smoaked shall be packed in barrels, the barrels must, in like manner, be branded with the word "Refuse."

Every person carrying on the business of a herring curer, before he can receive salt into store, must grant bond to the commissioners of excise, with *two undoubted sureties*, to a very considerable amount; and must make entry of premises for a salt store, which must be open to the inspection of the revenue officers at all times when they find it convenient to call on him; and must, at his own expense, turn out and weigh his salt when required so to do. He must every year give notice (in the Spring) to the excise whether he intends to cure with Liverpool rock, or refined salt; and *he is not permitted, however necessary it may be, to use any other* than what he may then name. He must give a new bond yearly, in the month of May, and cancel the old one.

No other salt is used in the British fishery, either for herrings or white fish, than Liverpool rock and refined salt.

Herrings may be packed in barrels made of *any kind of wood, with the exception of fir*, whether seasoned or not, provided their contents are thirty-two gallons English measure. Herrings may also be packed and branded in half barrels, *but not in kegs*.

Every cooper must brand his own barrels with his name and place of residence: they must also be branded by an excise officer with the letters B F, otherways no credit would be given for the salt; and no bounty can be obtained, until they are again branded by an officer of the fishery. Each barrel must be half an inch thick in the stave.

As to hoops there is no restriction, but Dutch *exportation* hoops are preferred by the coopers. Every barrel must be hooped with sixteen hoops; but those intended for the colonial market, besides two iron hoops, must be bound at both ends, like a wine-pipe.

Remarks.

In drawing a parallel betwixt the laws of the two countries, the disparity in point of efficiency is too striking to escape observation. The laws of Holland are cautiously and wisely constructed to *improve* and *maintain* the character of their herring-fishery, that inexhaustible mine of wealth to which Holland owes her exalted rank among commercial nations, and her strength and greatness as a naval power, the splendor of her cities arose from the same source, for their historians boast, that Amsterdam itself had its foundation on herring bones. It is many centuries ago since the Dutch established laws for this fishery; but the principal statute, or placard which was framed during the administration of their great statesman, De Witt, in 1667, with a few trifling amendments, rendered necessary by local occurrences, is the present existing law, by which the Dutch fishery is regulated.

The great extent to which the Dutch prosecuted the herring fishery in De Witt's time induced and stimulated other nations to embark in it; and various acts were passed by the parliament of Scotland to encourage the inhabitants to fish for, and salt, herrings; and bounties were given to those who fitted out busses *in imitation of the Dutch.* But, alas! among all these statutes not one rule or instruction is laid down for ASSORTING, GUTTING, LAYING, or PACKING the herrings, or the smallest inducement held out to the inhabitants of Scotland to anticipate their opponents either in fishing or reaching the continental market before them. On the contrary, *quantity, and not quality,* as in the present day, appears to have been the object and aim of all our statutes. All kinds of salt, too, whether proper or improper for the cure of herrings, were permitted to be used; indeed, so very ignorant were our ancestors of the nature and advantages of this lucrative branch of trade, that one of the Scotch statutes prohibited herrings from being exported *before* Michaelmas! All herrings caught before that date being ordained to be brought to public market for the supply of the country, in a fresh state.

Whether the Hollanders were the *first* who invented the process of *pickling* herrings has never, I believe, been ascertained; but the Dutch historians ascribe the merit of the discovery to William Beukeling, a native of Biervliet, in Dutch Flanders, who lived about the year 1390.* It is true that the statute 31st Edward III. "regulates the herring fair and fishery of Great Yarmouth, in Norfolk," but we hear nothing of *pickled herrings.* It was common in those days, both in England, Scotland, and Sweden, to throw herrings into vats and barrels with salt, *to preserve them until they could be brought to market* and disposed of; but so ignorant were the inhabitants of Scotland, long after that æra, of the pickling process, that a bounty was offered by the Scotch parliament to the Dutch "to fish for and pickle herrings on the coast of Scotland," in order to stimulate the inhabitants and instruct them in the art.

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* Anno 1437. Gulielmus Buecklensis sive Bueckelins, industrius et celeber piscator, primus artem invenit harengas saliendi atque in vasis salsamentariis stipandi; mortuus est Bierflieti in Flandria. Schockius, Dissertatio de harengis, Groningue 1649, 4to. p. 36—Petit, Grande Chronique ancienne et moderne de Holland, Zelande, and Dordrecht, 1600, fol. vol. 1, p. 184.

But it is a fact which cannot be disputed, that Beukeling was the first who *invented and practised the art of gutting*; and that the Dutch found means to conceal that as well as their system of ASSORTING, LAYING, and PACKING their herrings from other nations for about three centuries. So far back as the year 1511 they had keurmeesters and regulations similar to those now in force; and their herring barrels were marked by the curers and branded by the keurmeesters (distinguishing the qualities, assortments, and season when taken) in the same manner as is now practised in Holland; and I strongly suspect that the discovery of the boiled salt for curing their prime herrings (which is at this moment unknown to the British curers) had been made even previous to that period, for I find the following among other regulations for the retailers of herring in Amsterdam: "All herrings which are fished and cured after Bartholomew-day must be branded as such by the sworn keurmeesters, packed fourteen barrels into twelve, in the manner therein directed; the barrels branded with the city arms, and bound (for home use) with fourteen hoops, in terms of the statute 1st September, 1511."*

So early as the year 1471, and during the reign of James III, the Scotch parliament enacted, "That certain lords, spiritual and temporal, and burghs, should gar mak gritt shipps, busses, an ither gritt pink shipps, with netts an ither abuilzements for fishing." This act was confirmed by James IV, in the year 1491; when it was further ordained that no vessel should be employed in the herring-fishery under the burden of twenty tons.

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* Domselaar's Beschryving der Stadt Amsterdam, b. iv, p. 257, 4to. Amsterd. 1665.

In 1573 another act was passed for regulating the fishery; and by the statute of 1584 it was confined to certain towns in Scotland. Another act was passed in 1587; and as it is generally supposed that to open and promote any branch of trade to a great extent a company is better adapted than individuals, an act was passed in the first parliament of Charles II, 1661, to encourage the establishment of companies for carrying on the herring-fishery. In 1676 a company of this sort was established at Greenock, but it did not succeed.

In the year 1679 letters patent were granted by Charles II to establish the Company of the Royal Fishery of England. To this company was granted a premium of 20*l.* for every vessel they fitted out on the fishery; yet their capital of 12,000*l.* was soon expended, and the project abandoned. In 1692 an attempt was made to renew this company with a capital of 300,000*l.*, but King William, it is said, being apprehensive that it might injure the fishery of Holland, rescinded the erection of this company by an act of parliament.

In the year 1705 the Scotch parliament appear to have been sensible that the success of the Dutch, and the preference which they possessed in the continental market was solely owing to their mode of cure, for they not only offered a bounty to the Dutch to fish and cure herrings "on the coast of Scotland," but also offered a bounty of 10*s.* 4*d.* Scots, on every last of herrings *exported*, in whatever way they were taken; and 18*l.* Scots for every last of herrings "cured like the Dutch in busses." This was the *first bounty* granted in Great Britain *for the exportation of herrings;* and the Scotch parliament very properly, in imitation of the Dutch, *remitted the duties on all materials used in the fishery, and removed all restrictions of customs and excise* with which that branch of trade then was, and now is fettered.

For several years previous to the Union, the Scotch fishery, *even when no bounty was paid*, increased considerably, and the exportations from Scotland were immense; but the price obtained for Scotch cured herrings was so much below the price at which Dutch herrings were sold, that the government held out an inducement to the Dutch to fish in concert with our countrymen, so as they might acquire their superior mode of cure. The Scotch fishery was at this period at its height, and had the laudable intentions of the parliament been carried into effect, it may be questioned whether we should not, in a short time, have rivalled the Dutch.

After the Union, however, the fishery ceased, and in spite of all the props and supports which it received, has continued to decline. In 1720 a kind of general copartnery was formed for the purpose of reviving the fishery; it consisted of about 2,300 of the principal people in Scotland, and their capital was divided into shares of 100*l*. each, but it soon fell to the ground.

In 1727 the board of trustees was established at Edinburgh, to whom the management of 2,000*l*. per annum was given from the revenue of Scotland, for the encouragement of the manufactures and fisheries of Scotland; and although the trustees do occasionally give trifling bounties to persons concerned in the linen trade, and in the cod and ling fishery, I never heard of any thing being either given or offered to be given by them for the improvement or encouragement of the herring-fishery.

In 1750 the free British White Herring Company was established by act of parliament, permitting a capital of 500,000*l*. to be subscribed, and the proprietors to receive 3 per cent per annum upon the advances made during fourteen years. A bounty of thirty shillings per ton was also allowed on all busses employed by the company of from 20 to 80 tons burden. Although this national institution was supported by many of the most spirited and wealthy noblemen, it soon vanished into air.

This act also declared that every fishing company at any port in Britain having a capital of 10,000*l.* should be entitled to the same premium of 3 per cent, and to the bounty of 30 shillings per ton; but these terms were never accepted of. Three other acts of parliament were passed in the years 1753, 1755, and 1756, exclusively regulating the buss fishery, but the trade continued to decline.

In 1757, another act was passed whereby the buss bounty was increased from 30 to 40 shillings per ton; and so many individuals were allured by the bait, that not less than 22,296*l.* was paid in England, in 1771, of tonnage bounty; and during the year 1767, no less than 31,396*l.* in Scotland. But as the adventurers were no gainers by the attempt, the bounty was, in 1771, again reduced to 30 shillings, the number of busses was abridged; and in 1782, although a very few were fitted out in Scotland, not one left England.

In 1779, another act was passed, followed by an interim one, by which the herring-fishery continued to be regulated, until the Highland Society of Scotland interfered; and by their influence and patriotic exertions, the act which now regulates the fishery, and of which, with its amendments, I have given an outline, was, in 1808, passed into a law. Great expectations were entertained from the high premium of 3*l.* per ton, and other illusive advantages which this new law offered; and several individuals were induced to embark in the fishing. But year after year brought fresh proofs of its fallacy—the adventurers lost money—the number of busses rapidly declined; in 1820, only two busses started from

England, and one from Scotland; and the deep-sea herring fishery of Great Britain died without a struggle! Although no public notice has been taken of this event, yet, as it were to cover the disgrace, for the failure of such a grand national object must naturally entail disgrace on those who framed and supported such a bill, the commissioners for the fishery have quietly obtained an act of parliament, repealing the tonnage-bounty on deep-sea busses.

Thus, notwithstanding the numerous laws before recited—notwithstanding the various attempts, and the money that has been expended by the country, in bounties for the establishment of the herring-fishery, this great national object—this source of wealth, of industry and trade, still remains chiefly in the hands of a foreign, a rival, and a remote nation; nor have the subjects of Great Britain ever been instructed how to avail themselves of the bounties of Providence—of the treasures which their own shores so abundantly afford! As a learned writer observes, "Is our herring-fishery to be resigned for ever to foreigners?—Is Britain, from its present state, unable to prosecute, with advantage, this great national object?—Or, are the laws hitherto enacted on the subject so perfect as to admit of no further improvement? It would be deplorable, indeed, was either the public or the legislature to acquiesce in these sentiments; or, to presume from the failure of past attempts, that no other can be made with success."*

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* Professor Walker's Essay on the Natural History of the Herring, 8vo. Edinb. 1796.

Causes of the failure of the Scotch and British Fisheries.

It is admitted, on all hands, that the Dutch were the first who carried on the herring-fishery as a branch of trade, and the success which attended their endeavours induced the Scotch, and other nations, to follow their example. But the operations of both English and Scotch were at first confined to the supply of their own markets; while the Dutch, after carrying their herrings to Holland, exported them to other countries. Finding this to be a very lucrative branch of commerce, they increased the number of their busses yearly; and as they had no opponents, the trade was exclusively in their hands; and they supplied the whole of Europe with pickled herrings of their own curing. So early as the year 1614, the Dutch exported 74,000 lasts of herrings, which were estimated at 1,517,000*l.*; the price being then between 20 and 30*l.* per last. It is stated in De Witt's Interest of Holland,* that in the year 1667, his countrymen fished with no less than 2,000 busses; and that, at least 800,000 people in the provinces of Holland and West Friesland, were employed in, and supported by, the fishery. When, therefore, the Scotch embarked seriously in the undertaking, with the view of exporting their herrings, they laboured under the same disadvantages which the inhabitants of Great Britain do at this moment:—the Dutch held a precedency and a preference in the foreign market—they had a numerous fleet at sea; and their herrings were cured in a manner far superior to that of their opponents. The Scotch parliament were vain enough to cause busses to be fitted out *in imitation of the Dutch; but*

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* Het algemeen Belang der Vereenigde Nederlanden, p. 307, 4to. Amsterd. 1672.

restricted the inhabitants from exporting their herrings until after Michaelmas! by which time the Dutch had supplied the foreign market with a superior article. The busses that were so fitted out, were small, ill-found vessels, poorly manned, and destitute of that accommodation and convenience which is so necessary for the *assorting*, *pickling*, *laying*, and *packing* of herrings in the open sea; for these operations cannot be performed with any degree of propriety or accuracy in a small vessel; and these busses were, as in the present day, *forced to meet at a distant rendezvous.*

According to the present statute, all busses must, as I have shown, *be at Brassey Sound, in Shetland on or before the* 22nd of June, where, if they were numerous, the examination of their nets and other appurtenances by the superintendant, would necessarily *occupy not only days but weeks.* Such of these vessels as belonged to Glasgow, Greenock, or other commercial towns in the West of Scotland, would have to perform a longer voyage to this rendezvous, than even the Dutch Germans, or Danes; and although in their way through the Minch, or round the headlands, they fell in with a shoal of the finest herrings, *they must steer through them, without wetting a net!* And those from the coast of Norfolk, or east coast of Scotland, although the journey is shorter, would, under similar circumstances, fare no better. When the buss has passed in review before the superintendant, she proceeds to fish—*she must complete her cargo, or remain three months at sea to do it!*—So that, if in the *first week* she procured *nine-tenths of it*, she would be obliged to keep the sea for *eleven weeks for the other tenth*, or forfeit the bounty! If, as I shall suppose, she began to fish *with* the Dutch on the 24th of June, was successful, got the FIRST *herrings, cured them as well, and was permitted, by law,* to carry them to a foreign port, she might get from 12*l.* to 17*l.* a barrel; but if she kept the sea for three months, cured her herrings in the Scotch way, and sent them to Germany, she would, as was actually the case in Oct. 1820, get 17*s.* a barrel for them.

A herring buss of sixty tons burden, with her nets and materials could not be freighted for less than 60*l.* per month; and allowing that she completed her cargo of 400 barrels in three months, the time prescribed by the statute, what gainer could the freighter be, even allowing that in place of 17*s.* he got 20*s.* a barrel for his herrings, and the government bounty of 3*l.* per ton?—This I conceive to be a fair hypothesis, and I shall try the thing in figures.

400 barrels of herrings, @ 20*s.*		£.400 0 0
Government bounty, @ 3*l.* per ton		180 0 0
		£.580 0 0
Freight of the buss for three months, @ 60*l.*	180 0 0	
2*s.* per barrel to the crew, in terms of the act	40 0 0	
400 oak barrels, @ 6*s.*	120 0 0	
800 bushels Liverpool salt. @ 1*s.* 6*d.*	60 0 0	
		400 0 0
Balance in favour of the buss		£.180 0 0

After deducting, however, from this sum the expense of provisions, men's wages, insurance, port-charges, landing, storing, re-shipping, and freight of the herrings to the continent, it will be found that the adventurer has nothing to himself.

In 1820, by the printed report of the commissioners at Edinburgh, one buss sailed from Campbel-town, and two from Great Yarmouth, which vessels altogether took and cured in three months 629½ barrels, the selling price of which was, at Leith, on their return from the fishing, 17s.				£.535	1	6
Tonnage bounty paid (per said report) on the three				554	0	0
				£.1,089	1	6
Deductions:—						
Freight of the 3 busses, @ 60*l*. ...	£.540	0	0			
2*s*. per barrel to the crew	62	19	0			
629½ oak barrels, at 6*s*.	188	16	0			
Say 1,000 bushels Liverpool salt, @ 1*s*. 6*d*.	75	0	0	866	15	0
To be divided among the *three* busses ...				£.222	6	6

and which would not, in fact, pay the men's wages, provisions, port-charges, and other expenses.

But it must not be forgotten that besides the formalities of the fishery law, the freighter or proprietor of a buss has to run the gauntlet through a horde of custom-house and excise officers, both at clearing and returning to port, who generally lose no opportunity of seizing his salt or otherways molesting him, when it happens that through ignorance or inadvertency, some trifling punctilio of the law has been omitted. He has troubles and formalities not a few to get through before he can effectuate the payment of his bounty; and should it so fall out that he has only got one half, or one-third of his cargo, and has suffered severely by his adventure, he must also suffer the same trouble and go through the same formalities as those who have got a full cargo.

It has always been the aim of the British government to imitate the Dutch in their fishing; and the aim was laudable, had our fishers known their system, been enabled to follow their other movements, and to cope with them *in point of numbers;* but the original was neither to be equalled nor surpassed by a spurious copy: we have all along been as great strangers to their policy as to their mode of cure; we never studied the one or learned the other. The Dutch live at a distance of nearly 700 miles from the Shetland Isles, yet *the nature of their fishery* left them no alternative: it was necessary for their numerous fleet to congregate at or near a place where, *at a certain time, the herrings were known to emerge from the deep,* and from whence they had *the shortest run* to Germany and Holland. To prevent other nations from anticipating them in their preliminary movements, which would have been fatal to their undertaking, they availed themselves of the superstition of the 15th and 16th centuries: they were quite aware that herrings could be got at an earlier period around the coast of Scotland, particularly on the west coast, but as it would be both inconvenient *for their vessels,* and attended with much expense, to enter our bays and harbours in the Spring months to wait their coming, they, as it were, forced on the world a belief that herrings were not at maturity, or in a fit state for curing, before the 24th of June (the festival of St. John), and the better to deceive their cotemporaries, they prohibited their fishers from wetting their nets before that night.

But their chief motive for congregating at a given point, was not only to begin the fishing at one and the same time, but to enable the wachters as they were then called, or the jagers as they are now called, *to collect and carry off from the fleet such a quantity of rich early herrings* as would supply their own and the German market before the Scotch or any other nation, with a few ill-manned vessels, could possibly precede them.

Our ancestors *were even ignorant of the use of these wachters*; for in the year 1633, when Mr. Smith was sent by the earl of Pembroke to Shetland, in order to make inquiries concerning the Dutch fishery, he reported that in that year the Dutch had 1,500 busses of about 80 tons, 400 doggers of about 60 tons; "and 20 waffters or wachters, as they were called; *which were armed vessels for the protection of the fishery.*"*

But why should the British be restricted to a day? Why should they seek Brassey Sound or any other remote rendezvous, when the *earliest* and the *best* herrings are to be found in the Minch, in Thurso Bay, and at many other points of the main land, from the near neighbourhood of which places the gross of our busses sail? Could a project so inexpedient, and regulated by statutes so inapplicable and inconsistent ever be expected to thrive? This palpable blunder has been the very bane of the Scotch as well as of the British deep-sea fishery; and it is, beyond measure astonishing that the Scotch and British legislators should have persisted in an error so glaring for the space of 350 years, that is from the year 1471 to the year 1821.

But as our deep-sea fishing is for the present at an end, I shall offer a few remarks on the coast fishery of Scotland, and the manner in which it is conducted.

This species of fishing is either carried on in vessels furnished with salt and barrels, the crews of which purchase herrings from the fishermen, who take them in small boats, and bring them on board to be salted; or the herrings are carried on shore by the small boats, and cured in cellars, or more frequently *in the open air without any covering*; but the mode of curing in both ways is the same; and a bounty of 4*s*. per barrel is paid by the excise, under certain conditions mentioned in the statute.

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* England's Improvement Revived, by John Smith, London, 1673; 4to. p. 250.

The slovenly manner in which herrings are cured, both on board these vessels and on shore, is really too disgusting to be minutely described: but the coopers and peasants engaged in that trade look only to *quantity—quality* and *improvement* are as foreign to their purpose as they are to our laws.

Towards the end of June the wealthiest of our coopers about Leith and the neighbourhood (for poor men can neither find money to advance, nor sureties to subscribe, salt bonds) engage all the fishing-boats and their crews that are to be had at Newhaven and the other contiguous fishing villages. These boats proceed to Wick, or other stations in Caithness, about *the middle of July*, which they reach *about the time that the Dutch have supplied their own and the German market.* The coopers then send down small vessels loaded with salt and barrels, and *the fishing commences.* Should it so happen, as is generally the case, that a shoal is on the coast, the herrings are brought on shore in masses, and thrown like rubbish on the ground into small uncovered booths, which are formed by slabs or planks raised about three feet from the surface: In this booth several boys or girls are placed, wading among the herrings knee-deep, gutting them, some with knives and others with their fingers. They are then thrown into a basket, and packed *on their sides* in a barrel. *All sorts and denominations are huddled together without discrimination*; and *Liverpool salt only* is used both in priming and completing the cure. To ensure the payment of the bounty the herrings are frequently pressed down with a round wooden board while the barrel is re-packing, which operation is performed by a man standing and jumping on it with his feet; and if *plenty of salt* is added, and the barrel is thought to contain *the weight* required by the fishery-act, the cure is completed. This operation, however, as the herrings have then neared the shore to spawn, has frequently the effect *of squeezing out the large milt and roe*, which gives them a disgusting appearance. This is all that is looked to; for if a man can manage to make up one or two thousand barrels in this way, should he get no more than the barrel bounty he is sufficiently remunerated in his own opinion. This is the general practice: some coopers, indeed, are much more attentive and bestow more pains than others in putting up herrings; but although they are all equally ignorant of the Dutch mode of cure, or even of the materials, they confidently assure the purchaser, that they cure herrings as well as the Dutch in their busses!

When the coopers have expended all their materials, they are succeeded by the peasants, who could not otherways be supplied. These purchase the herrings at a much lower price than the rate at which the coopers engaged the boats, and the salting of herrings is carried on in a still more slovenly manner than before, until the shoal leaves the coast.

The eagerness of the wealthier coopers to procure *great* quantities of herrings often gives place to a kind of competition with the fishermen, and rather than be disappointed I have known them engage to give fourteen or fifteen shillings for *the same measure of fresh herrings*, which they afterwards sold at seventeen shillings *in a cured state, salt and barrel included.* Indeed the engaging of fisher boats in this way previous to the commencement of the fishing has been productive of the most serious evils; for independently of the high rate offered to the fishermen, the coopers also furnish them with a certain quantity of spirits daily—they must freight a vessel to carry their salt and barrels to the North, and another to bring their salted herrings to the South; and they have their own private expenses to bear, and the shipping, landing, port charges, and other dues, to defray.

Many extensive bankruptcies have, in consequence, taken place among these people, within the last two years particularly; and the deluded fishermen, instead of profiting by the high rate at which they were engaged, have been paid with a trifling composition of four or five shillings per pound sterling.

Formerly, when there was no such bounty, and when these fishermen received a moderate price, say five or six shillings per kran (the measure of fresh fish equal to a barrel) they were frugal, sober, and religious; they built boats and houses and were free of debt: but for some years back, the advance they received instead of benefiting their families has introduced extravagance dissipation and vice. Their earnings were soon spent, and they contracted debts which they could only engage to discharge at the conclusion of the ensuing fishing.

As I have before observed, every fish-curer, of whatever denomination, must execute a bond with *two* sufficient sureties to the excise, to a very great amount; and must not only enter the premises where he keeps his salt, but they must be at all times open to the inspection of the revenue officers. This restriction is sufficient of itself to curb and prevent industrious poverty from making an effort; but should it so happen that a plodding ingenious individual overcomes this difficulty by finding at his native place two friends to subscribe his bond, it would avail him little, for should he ship his salt in a vessel for the North, for the purpose of curing herrings at Wick or any other place, *he must before he can land a bushel of his salt* *execute another bond with two new sureties resident at that port ;* for should he land and place his salt in a cellar without doing so, it would be immediately seized by the revenue officers, and he would be subjected to an Exchequer prosecution !

By the operation of this law the coast fishery of Scotland is placed in the hands of, and monopolised by, wealthy individuals, to the exclusion of the poorer classes, who, if they found means to overcome these difficulties are prevented from obtaining herrings by a previous engagement of the boats by their wealthy opponents at a rate far above their ability to advance.

Although this abuse of our fishery has been the ruin of many wealthy and respectable men, it does not seem to deter others from following the same mad scheme, and the interposition of the legislature is imperiously called for to check its further progress.

If any of these curers, on the other hand, were desirous of curing their herrings on an improved plan at these fishing stations, where they are brought on shore in such vast quantities, I apprehend that two leading sections of our Fishery-act would go a great way to frustrate their intentions. It is directed that all fresh herrings delivered by the fishermen to the coopers shall be measured with a kran, a barrel somewhat larger than the common herring barrel, bound with iron hoops, open at both ends, and branded in a particular manner ; and that the *cured herrings* shall be of *a certain weight* as before stated. When the herrings, therefore, are brought on shore, they are cast with baskets into this kran, and on its being removed are thrown up like manure with spades and shovels into heaps, and thence in smaller quantities into the booths for packing. In this operation, their preservation and beauty, of which the Dutch are so extremely tenacious, are not only destroyed, but the scales themselves are completely rubbed off;

while the second operation of weighing, which is performed by tumbling the herrings from their original package into an empty barrel which has been previously weighed, completes this ridiculous and unnecessary work of destruction.

Sometimes, too, and that not unfrequently, when the herrings are brought home, the revenue officers on a suspicion that contraband goods might be packed among them, are permitted to satisfy their curiosity by running an iron rod or spit in different directions from the top to the bottom of the barrel.

These are what may be termed legal obstacles to improvement, to which every person concerned in the coast fishery is subjected; and which have their full effect in lessening the value of our herrings in a foreign market; but there is an abuse committed by the curers themselves which is extremely hurtful to the exporter; namely, that of packing the top and bottom with a few layers of good herrings to deceive the purchaser, and filling the middle of the barrel with small, broken, and other unsaleable herrings. This is what the Dutch call "bloemlaagen," a crime which subjects the offender to corporal punishment, the master of the buss to a fine of twenty-five guilders a barrel, and the fish so packed to confiscation.

It frequently happens that parcels of herrings are returned to the seller, in Hamburgh and other foreign ports, when the purchaser discovers this fraud; for the law as to the sale of herrings, which is the same as in Holland, entitles him to do so.

I feel it unnecessary to make any farther remark as to vessels which carry nets for the purpose of fishing in the open sea, but to whom no buss-bounty is paid, as they do not conform to the regulations laid down for the deep-sea fishing, than that their operations are chiefly confined to the lochs in the Minch and in the West Highlands. They sometimes fish with their nets, but more frequently purchase fish from the small boats as they find most convenient, so that these vessels are rather to be considered as magazines for holding materials than as open sea busses. It is however a gross mistake, to suppose that this species of fishery is a nursery for seamen—nothing can be more unfounded. There is seldom an apprentice on board of these vessels or any person fit to serve in the navy. The masters are, for the most part, coopers, and the only seamen who are engaged to manage the vessel are poor broken-down creatures who cannot find employment elsewhere. The rest of the crew are highlanders or mechanics casually picked up, who when the fishing terminates return to their usual avocations, and do not go again to sea until the next fishing season. I must, however, do the crews of these vessels the justice to say, that with the exception of the *Yarmouth deep-sea busses*, more care and attention is bestowed on the cure of herrings by them, than by any other individuals concerned in the British fishery. The herrings on the West coast, as I have before observed, are far superior to those taken off any other part of Scotland. They are much higher in price, are generally cured for home consumption, and are seldom exported to the continent.

On reverting however to the Dutch laws and their mode of cure, it will appear, that *all our herrings*, whether cured in busses or on shore, can only claim the character of UNASSORTED or MIXED HERRINGS in the continental market; and even were they put up with more attention than they generally are, cannot be expected to command *a higher price* than that at which *Dutch herrings of the same class* are sold. This is a fatal truth which cannot be too strongly impressed on the notice of the legislature; for this, added to the improper use of *Liverpool salt, at all seasons*, and for *all kinds of herring*, must effectually prevent them from rising in price, or remunerating the importer in the German market.

Hints and Suggestions for the Improvement of the British Herring-Fishery.

When the late Mr. George Rose was employed in framing the act which with some few amendments now regulates the British fishery, he was unfortunately guided in his movements by revenue officers only, who, in turn, drew and collected information from such of the most wealthy Scotch coopers as had long been engaged in salting great quantities of herrings in the manner now practised in the coast fishery. Thus every possible care was taken to preserve entire the spirit and severity of the salt laws, and to confine the fishery to great capitalists; but no attempt whatever was made *to improve the mode of cure—to discover or inquire into* the system of Holland, or to encourage individuals to compete with the Dutch in a foreign market. When this act made its appearance the public were taught to believe, that it was nearly a transcript of the laws of Holland, and that on that account the greatest national advantage might be expected to result from its operation; but years and experience have proved the fallacy of this opinion.

A learned writer on the Herring-Fishery observes, "That towards the end of the 16th century, the Scotch, in the exportation of herrings, became in some degree rivals to the Dutch. During many years before the Union, the herring-fishery was a flourishing and beneficial business in Scotland, but was at that era annihilated, and has never since been recovered. It was then all carried on upon the coast in open boats and *without any bounty;* but the Scotch parliament, in imitation of the Dutch, very properly remitted the duties and exactions payable on all materials used in the fishery, and it was a more gainful trade both to individuals and to the nation, than it is at present with all the bounties and premiums given by the public.

"The cause of this unfortunate alteration in the state of the Scotch fisheries may be easily traced. Previous to the Union they formed the principal branch of commerce in the kingdom; they were therefore carefully protected by the legislature, and many salutary laws were enacted from time to time by the Scots parliament for their encouragement; particularly, all the people in Scotland engaged in the fishery had *easy access to salt of good quality, free of all impost, at the cheapest rate, and in the most unconfined manner*, without which it is impossible any fisheries can flourish. After the Union, the enactment of the salt duties and the complicated regulations established for their management, the difficulties in obtaining salt, and the *great risk* incurred by traders entering into salt bonds, at once depressed the fisheries of Scotland, which for long had worn the most promising appearance."

To these causes, therefore, to the *increased severity* of the revenue laws, to our injudicious imitation of the Dutch busses without studying either the policy or system of the Dutch, and to the payment of bounties *on quantities of unassorted herrings*, cured in the wane of the German market, may be justly attributed the failure of the deep-sea fishing, the decline of the coast fishery, and the ruinous consequences which have resulted to individuals.

To improve and establish the herring-fishery of Great Britain upon a sure and solid basis, and such as I flatter myself would render it a branch of trade, at once lucrative and advantageous to individuals and to the nation at large, I would humbly propose and suggest:

That it should be lawful for any subject of Great Britain or Ireland to fit out a buss in the manner of the Dutch, *to fish with nets*, from any part of the United Kingdom; and send her *to such a latitude, or to such a point as he might think most suitable to his purpose.* Such buss to be manned with a sufficient number of *thorough-bred seamen and apprentices*, one or two coopers, for heading and repairing the barrels, and in the option of the owner or freighter such a number of Dutch fishers, as he might think proper to engage for the purpose of instructing his crew in the branches of assorting, gutting, laying and packing the herrings. The owner or freighter to be under no restriction as to the quantity of netting, provided the meshes be of such dimensions as not to injure the fry or young herrings: Neither should he be restricted as to the quantity of barrels or salt, but allowed to act, in this respect as his circumstances and ability might warrant; but no buss, *on the herring-fishery only*, to be allowed to clear or leave port before the first of May in any one year.

The owner or master of every buss to be obliged to brand his barrels with his own particular brand before leaving port, and subject them to the inspection of the clearing officer, who if unacquainted with that trade, or doubtful of their sufficiency, should be authorised to call a survey by two coopers resident at the port, by whose decision he may suffer them to be shipped, or reject those that are defective. It might be injudicious *at first* to prohibit the use of ash, willow, or beech barrels, but it would be proper to recommend strongly to all persons concerned in the *early herring fishery*, and indeed in every branch of it, to use only oak barrels; for to *all other wood, except oak*, does the fixed oil of the herrings adhere, nay, I have often remarked, that in birch barrels where there were many knots, the fixed oil was at first imbibed, and afterwards exudated, which made the herrings at the sides of the barrels that came in contact with it become rancid.

Every buss-master should be obliged to weigh over his salt in presence of the excise or other revenue officer, who should be empowered to cause the same to be surveyed by a chemist, to ascertain whether it be of a *quality* and *condition* fit to be used for curing herrings before he allows it to be shipped. The master and owner to give bond to the proper officer of the port for the due application of the salt, under a certain penalty, *but no sureties to be required.*

Every buss-master previous to fitting out for the fishery to be furnished with a printed schedule from the collector or other officer at the port where he resides, or from which he must clear, *containing all the regulations and instructions* necessary to be known, and as practised by the Dutch, so as he may follow their system implicitly; and he should make oath, with two of his crew, and promise to implement the same to the best of his power so as to entitle him to the bounty aftermentioned.

That a bounty of three hundred pounds be paid to the person who shall make the first importation to Hamburgh before the Dutch or any other nation; two hundred pounds for the second, and one hundred pounds for the third; and a bounty of 4*s.* per barrel on all herrings *properly assorted,* cured by busses and exported to Hamburgh up to the 1st of September, when the same should cease. To insure the immediate payment of such bounties, as well as to protect the revenue, the master on arrival at Hamburgh to produce his journal to the British Consul, to show what herrings he has cured, and what quantity of salt he has expended; and the Consul to forward by post, to the Custom House or Excise Office, from whence the vessel cleared, a certificate showing the quantity of herrings landed and sold at Hamburgh, and the prices obtained for them; and to deliver a duplicate of such certificate to the master. If thus on his return to port, any defalcation appears, he will forfeit *both his bond and the bounty*. No herrings from busses to be landed or branded in Great Britain—that measure being thus unnecessary; and the vessel to return from Hamburgh and prosecute the fishing according to the inclination of the master or owner; and although no bounty shall be paid on herrings so cured and exported, *after the first of September*, yet the master shall not be prohibited from curing herrings as long after that period as he pleases, for the West-India market, or for smoaking, without any bounty, provided that he *assorts* them; or if cured *unassorted*, that he lands and causes them to be branded, in terms of the regulations.

I would also propose that a handsome premium be paid on the first, second, and third importations to Stettin, Pillau, Dantzig, Riga, and St. Petersburgh, provided that the latest of such importations takes place *on or before the first day of* August; and, from that period up to the first of September, that a bounty of 4*s*. per barrel be paid on all buss herrings sent to these ports, provided they be *gutted*, *assorted*, *laid* and *packed* in terms of the regulations—but no bounties to be paid on any buss herrings exported to the Baltic after that period.

Although it could not with propriety be enforced, it might be recommended to the owners of busses to keep company, if possible at sea, in parties of five or six, one of which, in the event of a thin fishing, might act as a jager to Hamburgh for behoof of the whole, and to be paid for doing so by previous agreement, among the whole, at setting out. *No tonnage bounty to be allowed* on any buss or other vessel employed in the British fishery.

As to the coast fishery, by small boats, or that which is carried on by vessels (with or without nets) purchasing fresh herrings from small boats, I would propose that a bounty of two shillings per barrel be paid on all herrings cured in that way provided they are gutted by a knife *within twelve hours* after being taken, *measured with baskets* instead of a kran, properly ASSORTED, in the Dutch manner, and the barrels regularly dated, marked, and branded, to show the assortments. That the practice of gutting herrings with the fingers be strictly prohibited; that *no bounty* be paid *on ungutted herrings*; but, on the contrary, although they may be brought in in that state, roused, or sprinkled with salt, for the purpose of being smoaked, that they shall not be allowed to be pickled or sold in that way, unless branded as "Refuse" and exposed to sale at half price. That no bounty whatever be paid on herrings which are UNASSORTED, and if any are cured in that way they shall be branded by the proper officer as such; neither shall any bounty be paid on herrings cured only with Liverpool, French, or St. Ubes' salt. That the mode of engaging boats, as at present practised by the coopers, be prohibited as highly injurious to the trade: the fishermen ought to take the chance of the market for the fresh fish, and every individual who inclined might freely participate in the fishery: by this means it may be presumed the herrings would be pickled in smaller quantities, and more care and attention would be taken in curing them.

The free importation of salt from Ivica, Lisbon, and Cadiz, for the use of the fishery should be granted to every individual concerned in it. These salts are essentially necessary to the cure of herrings; and, as it is an object of no great consequence, I think the legislature should at once repeal the present import duty of 3*d.* per bushel. This would open a kind of trade for our shipping, and encourage the exportation of cod and ling to the Mediterranean; for the inhabitants of these places will gladly barter salt and other goods for fish.

These salts, being formed by the heat of the sun, are in harder crystals, and, generally speaking, are purer than either Liverpool or Scotch salt, both of which are made by boiling down rapidly, and at a high heat, either brine or sea-water, and it is well known by all who have made comparative experiments that the bay salt is a much more powerful antiseptic, and far better adapted than any other of the above salts for the preservation of fish, especially in a warm climate.

But the grand desideratum in the British fishery is the *Keet Zout* manufactured by the Dutch at Dordt, and with which, as appears from the sketch I have given of their laws, their best herrings are cured. This salt, which is certainly much superior to all others, is made from Mediterranean, bay, and Liverpool rock, salt, by dissolution in sea water, and refining the brine after it is put into a state of evaporation.

This salt, it is stated in some old Dutch tracts I have seen, was discovered by an eminent physician of Cologne, many centuries ago, and was manufactured by him in his native city; this manufacture he bequeathed, at his death, to the senate, for the support of an alms-house; but the Dutch purchased the works from the senate, and entered into a contract to support the alms-house: this contract is mentioned and referred to in the 33rd section of the placard, or ordonnance, passed at the Hague in May, 1651. The Dutch manufac tured the salt at Cologne for a long period of years, but afterwards erected works of their own at Dordt, where it is now made. The Dutch themselves acknowledge, however, that considerable improvements were made in the manufacture of this salt at the suggestion of their great physician, Boerhaave.*

It is really astonishing that, even to the present day, this salt should be unknown to the British curer. I sent a specimen of it, as a curiosity, to the fishery board at Edinburgh, so far back as August 1818; but no inquiry was made in consequence. In the manufacture of this salt, however, even at Dordt the Dutch labour under a great disadvantage, for the water is there so brackish that they have to employ vessels to go to the North Sea and bring in salt water for boiling; and two ships of this description (denominated the Zee Scheepen) may be seen daily passing and re-passing to Dordt. How easily, then, and at how much less expense might not this salt be manufactured on the estates of his grace the Duke of Northumberland, or the most noble the marquis of Stafford? No ships would be there wanted to carry salt water, for their properties are bounded by the German Ocean, and they are in the near neighbourhood of coals which the Dutch must import at a very extravagant rate from England.

As this is the salt with which the Dutch salt their excellent butter and cheese, and apply to all culinary purposes, great advantages would be derived from the manufacture of it in Great Britain, as well for the herring fishery as for our extensive dairies. I hope to be enabled soon to transmit to the Society, for the purpose of being inserted in their transactions, a full and complete account of the manner in which it is manufactured in Holland.

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* NEUCRANZIUS Exercitatio Medica de harengo. Lubeck, 1654, 4to, p. 74.

That the Dutch-cured herrings, independently of other properties, should possess a different flavour from those of Great Britain or Ireland is not at all astonishing, when we consider the very superior quality of this and other salts with which they are pickled. Indeed it would be ridiculous to suppose that all denominations of herrings, whether fat or poor, in season or out of season, huddled together in the most slovenly manner, and salted with Liverpool or Scotch salt, should be expected to remunerate the importer in a foreign market, in competition with those of Holland.

At one time I made a small importation of this and some other salts, viz. Hamburgh, but paid dearly for my temerity: the salts were shipped by one of the Leith and Hamburgh smacks in large barrels, as being most convenient, but the moment the vessel arrived at Leith she was seized by the revenue officers and the broad arrow placed on the mast. On applying to the Board of Customs, at Edinburgh, however, and explaining, by petition, the purpose for which I had imported it, the seizure was removed and the salt was ordered to be restored, on payment of the duty, and *a fine of five guineas to the seizing officer!*

The seizure was made in terms of some old statutes prohibiting the importation of salt from Germany, *in any other manner than in bulk*, a thing which is impossible by a vessel loaded perhaps with salted hides, oak bark, and other commodities, which would render it useless. It is much to be regretted that old statutes so inapplicable to the present day, and so injurious to the fishery, should be allowed to remain in force, for the British curer is put to trouble and vexation enough with the modern enactments.

That every fish-curer should be obliged to enter a cellar for his salt, and open the same when required, for the inspection of the revenue officers should the duties on salt be continued, is a measure which cannot well be dispensed with; but that a poor man should be forced to grant a bond *with two sureties, to a large amount*, appears to me to be unnecessary, and highly detrimental to the improvement of the fishery. Should a fish-curer wilfully and wittingly apply a part of his salt to other purposes than that of curing fish, he is amenable to the court of exchequer, and may be fined to such extent as the circumstances of the case may warrant; and in default of payment may be committed to prison—but why *deprive* an honest industrious individual of the means of making an effort for the support of his family, in a branch of national trade? It is very seldom indeed, that any defalcation takes place in a fish-curer's stock—casualties have happened, no doubt, through the admission of rain into their cellars, or fire; these, however, were accidental, and being satisfactorily accounted for, were passed over; but allowing that a fish-curer did smuggle a few bushels of salt, and could not pay the fine awarded against him, I apprehend that the injury done to the revenue would be so trifling as hardly to warrant the expense of a prosecution.

I would therefore humbly suggest that the fish-curer's own personal bond, without any surety whatever, should be taken; and if engaged in the coast fishery, only, that he should be at perfect liberty to weigh his salt over to the excise officer, in the manner before noticed—carry it to any fishing station, at a distance he may find most convenient, and there deposit it in a cellar, or any other situation suitable to his purpose, provided, that on his return, he gives an account of the quantity he has expended; and in proof thereof, presents to the officer before whom the salt was weighed, the herrings cured therewith, who *shall not brand the same until he is satisfied* that a fair account has been rendered: and should *any glaring defalcation then appear*, that such officer should be at liberty to *make seizure of the herrings*, so presented for branding; and cause them to be conveyed to the Custom-house or Excise warehouse, *until the duties on such short coming be paid*, or until the pleasure of the board be communicated to him thereon.

Should this arrangement, however, be deemed too loose and insecure for the revenue, then let large warehouses be built at the expense of government, at all the fishing stations, into which, fish-curers may deposit their salt at their own expense, on delivering to the revenue officer, having charge of such warehouse, the permit or sufferance from the home port, showing the quantity shipped: the curer to pay the same rate of rent as he would have paid for any other warehouse; and the officer to give him out the salt, by weight, as he may require it; and when the fishing terminates, a certificate, showing that the whole, or what part has been expended in curing herrings.

I would also propose that all herrings taken, up to the 1*st of September*, *should be appropriated for the German market*, and home consumption; and *the later-caught herrings for the West-India market*. This arrangement would prevent a great deal of trouble both to the revenue officers, and to the curers themselves. The Dutch have shown us the example in this respect, for they always did, and always do appropriate the herrings caught and cured after Michaelmas to the colonial market. It is strange that *foul fish* should be preferred for this purpose, but it is really the case; *if washed clean* with, and re-packed *in their own pickle*, with *fresh Keet Zout*, the Dutch assert, that they will keep for twelve months in any climate of the world; but I imagine if an addition was made to the pickle, by a mixture of soda with the pyroligneous acid, that the preservation of herrings would be rendered more complete in a tropical climate. I am convinced that this composition, judiciously used, in similar cases, would prevent salted provisions from becoming rancid or rusty.

The Dutch bind their herring barrels with a particular kind of hoop, made from a species of willow unknown in Great Britain. The rind or bark is of a dark brown or red colour, which added to the manner of placing these hoops, distinguishes a Dutch herring barrel from that of all other nations; and the Hollanders are so sensible of this, that although they export vast quantities of hoops to Great Britain, *a single red hoop will never be found among them.* The exportation of this article is carefully and strictly prohibited. The British bind their barrels with very indifferent hazel and willow hoops, placing, generally, three at the top, three about six inches below these, and ten at the bottom; and as the barrel is nearly cylindrical, the whole weight and stress rests, when rolled, *on the staves,* which frequently causes the pickle to escape. But the Dutch place four hoops at the top, four at the bottom, and four on each side of the bung hole, *on which the whole weight of the barrel rests;* and as the Dutch barrel is wider at the bulge than the British, it can be rolled with more safety, as the staves never touch the ground. As these hoops are far superior, in every respect, to any species of hoop to which the British curer has access, it would be of consequence to procure plants of this willow from Holland, which might be reared and propagated at a very trifling expense, in the highlands of Scotland, and in the near neighbourhood of our principal fishing stations.

To obtain and establish a preference for British cured herrings in Hamburgh, and the Baltic ports, is the first and grand object to which the aid and interposition of the legislature ought to be directed. It would not only place the trade, exclusively, in our own hands; but the herrings cured *on the coast*, would be purchased by our colonists at such a price as would fairly remunerate the individuals who embark in the coast fishery.

It is the Hamburgh market *which always regulates the home market*; and if we allow it to be pre-occupied and monopolized by foreigners, we certainly cannot expect any other result than we have experienced. But a preference once obtained and maintained there, would place the British white herring fishery on a sure and solid basis; and, in place of being what it now is, a burthen on the nation and the ruin of individuals, it would become a lucrative and gainful trade, a spur and incentive to industry, and a nursery of the most active and hardy seamen in the world.

No man who has the interest of his country at heart, can behold with unconcern, the annihilation of our deep-sea fishing; or, if I may be allowed the expression, the transfer of our birth right to a rival nation; and see our herring-fishery, in spite of all the money that has been expended for its protection, sink to that degree of insignificance, as to be carried on by a few small boats, creeping about, as it were, in our creeks, harbours, and bays. While the offing presents to the eye a well-manned fleet of foreigners, under a crowd of sail, carrying off the richer herrings of the deep, for the supply of a market which we could at all times reach and fill before them! May not the question be asked—are government aware of the state of our fishery?—Is the navy of Great Britain to be manned from a fleet of coblers; or, is it policy to expend so much of the public money in bounties for *quantities* of *ill-cured, unassorted* herrings, unfit for any market save that of the colonies?

Several causes might be assigned for the decrease in the demand for pickled herrings, compared to what it was many years ago; and although the Dutch impute the falling-off of their fishery to the immense quantities of herrings cured by the Swedes and Norwegians, still the whole quantity caught, at present, by all the European nations, is greatly below what it was about seventy or eighty years ago.

Notwithstanding the great advantage which the late war afforded to the British, to the Norwegians, and the Swedes, particularly from the year 1805, to the year 1813, when Holland groaned under the tyranny of Napoleon, and when their busses, if they ventured to sea, were captured and destroyed by our cruizers, the Hollanders have been gradually extending their fishery; and, if I am correctly informed, upwards of fifty new busses will this year be added to their fleet. And although the quantity cured by them, since the emancipation of their country, may be inferior to that of Great Britain, still *it is a prosperous and increasing trade*, and of general benefit to Holland: for while our salted herrings are merely consumed by the poorer classes on the continent, and by the negroes in the West Indies, Dutch herrings continue a favourite dish and a luxury at the tables of the great. They are exported to the Cape of Good Hope, at a great expense; and, notwithstanding of a duty amounting almost to a prohibition, are actually imported into the Metropolis of Great Britain.

Of the open-sea fishing, as it is called, or that which is carried on by vessels with nets, salt, and barrels, and who sometimes fish, and sometimes purchase fish from the small boats, as before described, very little benefit can be expected to result either to individuals or to the nation, unless this species of fishing, like that of the coast fishery, is to be appropriated solely to the supply of the colonial market; and I cannot do better in concluding this paper, than quote the remarks of an intelligent commentator whose labours and suggestions for the improvement of the fishery, and other branches of manufacture, have been of essential service to the country.

In speaking of the Minch, where I maintain the best herrings are to be found, he says, "I had occasion to be on the great Minch at several different times, from about the middle of June until towards the end of September, and had ocular evidence that the whole of that extensive sea was crowded with herrings *of the best quality*. On one occasion when the sea was calm and smooth, I saw vast numbers of herrings passing the vessel; and was told that the crews of different vessels, then riding on the Minch, actually caught considerable quantities *with hand nets* constructed on purpose. When I was coming away, I had occasion to traverse a considerable part of this sea, and was becalmed upon it during a very dark night. The sea, as usual, shone at the surface when agitated by a stick, or point of an oar; but what struck me most was, an immense number of glancing lights all around the vessel, without any apparent agitation of the sea. The people on board, all assured me that these lights were caused by herrings; and that they often exhibited such lights in dark nights.

"From these facts, I was led to infer, that the whole of that extensive sea was swarming with herrings, during this long period. Indeed I was not singular in drawing this conclusion; but found it strengthened and confirmed by the opinion of the various crews who conveyed me in their boats, and by those with whom I conversed, all of whom are expert fishers, and were anxiously expecting the entrance of the herrings into a loch where they might be able to catch them. Why they did not come in, is one of those secrets respecting the natural history of herrings which human genius has not yet developed. But had only *one-half* of the busses (open-sea vessels as they are called), *which were loitering in the different lochs doing nothing*, been employed *in the Dutch mode of fishing, in the deep sea*, they might have caught herrings sufficient to have fed the inhabitants of the whole British Isles.

"The different premiums given by government, *have already operated their full effect*, in making the highlanders tolerably expert in catching herrings in lochs; and were some mode devised for allowing *the use of salt free from revenue bonds, and other perplexing formalities*, without injuring the revenue, perhaps these bounties might now be safely diminished, if not withdrawn.

"The result of the preceding statement is, that it highly concerns the interest of this country, that the Dutch mode of catching and curing herrings in the deep sea should be recommended and stimulated by bounties and otherways, *cost the attempt what it may*. It is probable a sufficient number of Dutch fishers might be found to embark in our vessels, to teach our men their mode of catching and curing herrings. To these, besides the wages that might be agreed upon, and paid by the individual adventurers, government should allow a small premium on every barrel of herrings caught, and *properly cured*. This would stimulate their exertions, and might be a separate bounty from that given to the adventurers themselves who equip the vessel. After our people are fully masters of this mode of fishing, the bounties may be gradually diminished, and, at last, withdrawn.

"The advantages of this measure would be a great increase in the number of our seamen, and a vast store of highly nutritive food added to the subsistence of our people. It may be observed, that in these northern seas, even in seasons when the herrings come into lochs in the greatest abundance, they are always roaming about in the open sea, *from one to three, sometimes four months*, before they enter any loch. At this period, and even when they happen to enter early into a loch, they are commonly *too fat for exportation to the warm climates:* but they are easily cured *for home consumption*, and are *delicate in their flavour, and nutritious* beyond what people on the eastern coasts can form any idea of. Their motive for coming into the lochs is to deposit their spawn, and then they are full of roes, lean, and are *neither so palatable nor nutritious*. But in this state they keep best in warm climates.

"By adopting the deep-sea fishing, *one or more months would be gained*, when the quality of the fish is in the highest perfection *for home consumption*. When they go into lochs there is nothing to hinder these vessels to follow them and to continue their operations as long as the herrings are worth catching. Our present mode is extremely imperfect and uncertain. Often vast shoals come into lochs, where there are neither vessels, salt, nor casks. The rumour of this seduces adventurers to make great exertions the ensuing year, when, perhaps, few or no herrings are to be got in the lochs. This is attended with much loss to individuals, and operates as a discouragement to the fishery in general."

In narrating my own proceedings—in the natural history of the herring—in sketching the laws of Holland and Great Britain—in remarking thereon, and offering hints and suggestions for improvement, a minuteness which, perhaps, may sometimes be deemed tedious, has been observed; but in a subject of so much importance, and in which so many abuses remain to be eradicated, general observations would have been incompatible with accuracy.

I am, Sir,
&c. &c. &c.
J. F. Denovan.

To A. Aikin, Esq.
Sec. &c. &c.

SIR; Aberdour, Fife, 28 December, 1822.

In April last I had the honour of transmitting you an essay on the herring-fishery, which I lately learned from my friend Howard had been referred by a committee to the next session of the Society; and that the sixteen gallon barrel of herrings, which I forwarded in December 1821, had been kept as a specimen.

Owing to the circumstance of my brother's indisposition my movements in the herring-fishery this year were unavoidably much abbreviated. But although the scale was limited, fortune has again crowned my endeavours with success. The first six barrels I exported, and which were consigned to the house of Mr. Jurgen Bona Meyer, reached Hamburgh in the *morning*, and the *first* Dutch jager in the *evening*. Thus I claim the victory. I got sixty-five dollars a barrel for my first herrings, being five dollars per barrel more than I ever obtained in that market.

The summer, in the north-west of Scotland, during the months of June and July was uncommonly warm and dry, and consequently few or no herrings were to be taken; and this will always be the case in the absence of rain for the reasons stated in my essay. I could, therefore, only manage to send twelve barrels more to the German market, which owing to calm weather and contrary winds, did not reach their destination until the beginning of August. By the accompt sales transmitted from Hamburgh they were sold on the 6th of August, and when common British herrings which had previously reached that market could hardly be sold at from 17 to 25, my herrings brought from 60 to 90 marks currency, affording the most satisfactory proof of their superiority to those of Scotch *unassorted* herrings, which, as I have explained in my essay, come under the denomination only of *wrack* or refusal, as well in Holland as in Hamburgh.

As my herrings are now greatly in demand in Edinburgh and other towns in Scotland, I cured thirty-six barrels more, which were afterwards put up in small kegs and sent to my agents at these places. They leave a very good profit in this way, and appear to give great satisfaction to the public.

As however the herrings contained in the sixteen gallon barrel forwarded as a specimen to the Society in December last, cannot, at this distance of time be expected to be in the best order, I have felt it a duty as well to the Society as myself, to send a sixteen gallon barrel containing a fair specimen of *assorted* herrings of this year's taking. They are not of the early *maatje* species, but such as I cured in July, when at full maturity, and which are denominated by the Dutch *zuiver vollen haring*, sound, full-sized herrings.

I have also the honour of transmitting you in illustration of my essay, and in corroboration of what I advanced as to the food of herrings, three vials put up in a small box, marked Nos. 1, 2 and 3. No. 1 exhibits the contents of a herring's stomach, taken and opened on the 4th of July last. On cutting up the herring the stomach seemed much distended; and on opening it with a lancet there appeared a dense mass, like a piece of roe, full of black spots; this I threw into spirit of wine, which showed a quantity of half-digested shell-fish fry; they may readily enough be seen with the naked eye, but appear quite distinct when laid on paper and viewed with a magnifier. I thought it as well not to filter or renew the spirit, so that the whole contents, including the gastric juice, might remain as entire as possible.

No. 2, contains the entire gut of a herring; the stomach enormously distended with the fry of shell-fish; two counter-openings, with black bristles inserted, show them distinctly; the vermicular substance suspended by the cotton thread is the roe.

No. 3 contains the stomachs of five herrings cleared of the fat, &c. From their pellucid state, before immersion in spirits, I could perceive in the largest three or four, and in another one or two young prawns. The remaining three contained nothing but the oleaginous milky fluid usually found in the stomachs of fish, and which has induced a general belief that they subsist by suction of some attenuated aliment, or invisible animalculæ, which the water affords. In short, No. 3, shows the ordinary state of contraction, while No. 2, by exhibiting the extent of distension of the stomach, affords the most unequivocal proof of the voracity of the fish, when within reach of their prey, and of the food they devour.

Some of the herrings caught in the beginning of July were extremely rich, and yielded half an ounce of limpid oil, on being subjected to heat. I have no doubt that this oil, which is of a superior quality, might, on being refined, be found useful for many purposes. The sixteen gallon barrel and box are addressed to the care of William Vaughan, Esq. Mincing-lane, for the Society, and I hope will reach their destination in safety. I have the honor to be, very respectfully,

Sir,
&c. &c. &c.
J. F. Denovan.

To A. Aikin, Esq.
Sec., &c. &c.

N° II.

WINE FROM NEW SOUTH WALES.

The Large Silver Medal *was this Session presented to Mr.* Gregory Blaxland, *for Wine the produce of his Vineyard in the Colony of New South Wales.*

It appears from the Custom-house and other documents that ¼ of a pipe of red wine was in March, 1822, shipped from Sydney in New South Wales. This wine, the property of Mr. Blaxland, was made by him from grapes the produce of his vineyard at Paramatta. About 10 per cent of brandy had been added to it in order to enable it to bear the voyage.

On examination by the committee it appeared to be a light but sound wine with much of the odour and flavour of ordinary claret, or rather holding an intermediate place between that wine and the red wine of Nice. The general opinion seemed to be, that although the present sample, from the inexpertness of the manufacturer and the youth of the vine, is by no means of superior quality, yet it affords a reasonable ground of expectation that by care and time it may become a valuable article of export.

Subjoined are two documents respecting the state of Mr. Blaxland's vineyard, the one being an extract from a memorial addressed to governor Macquarrie, in October, 1818, and the other addressed in the following year to J. Bigg, Esq. the Commissioner of Inquiry.

As your excellency was pleased, at the muster at Paramatta, to make inquiry how far I had persevered in the culture of the vine; it may not be uninteresting if I state for your information how far I have succeeded in the business, and also what prospect I may flatter myself I have of being successful.

On referring back I find that I had the honour of communicating with your excellency last on that subject, in the month of September, 1816; at which period I was preparing the land for a vineyard, by trenching it at a very heavy expense, and was raising a considerable number of plants to plant it with, of a sort which I believe to be the real black Constantia grape from the Cape.

Since which time, from observations I have been able to make on the nature of the soil and climate of the colony, and also of the nature and habits of the different kinds of grapes introduced into it, I have considered it most advisable to change both the aspect and situation of my vineyard, and also the sort of grape entirely; which circumstances have retarded the progress of the undertaking considerably.

I am fearful it is not in my power to explain myself in detail, so as to be clearly understood, why I have considered it advisable to change the situation of my vineyard; therefore I will say nothing on that part of the subject for the present; but as I hope to be more successful in giving my reasons for changing the sort of grape, that I will attempt.

I have first to observe, that the vines in general are subject to two different diseases or blight in the colony; one destroys the young shoots and leaves in the early part of the season, which stops their growth and destroys their blossom; they appear as if burnt or scalded. The other affects the grapes as soon as they are grown to the size of small peas; it appears as a black speck on the berry, with a small puncture in the centre, after which they remain hard and sour, and never fill with juice nor ripen; and if the speck extends far the berry entirely dries up and perishes.

Observing this to be the case from my first coming into the colony, I have at all times since endeavoured to procure every kind of vine that I could meet with, that I might be able to select those sorts that were the least subject to blight; they now amount to eight sorts of bearing vines; I say bearing vines, because many of the vines first introduced into the colony were actually barren and unproductive. Amongst the different kinds I had collected, the Constantia was in my opinion in every respect the best, and I planted out (as I have before observed) a large quantity of the cuttings from it. Accidentally some of the cuttings of the different sorts I had in the same garden got amongst them, and were intermixed with them in the same beds. That year the whole of them were blighted in the leaf and young shoot, except a small sort which I had not before held in very great esteem; of this latter every individual escaped injury, although their leaves actually touched the other plants that were almost destroyed with disease; they continued to flourish the whole season and made vigorous shoots many feet long, when the others scarcely grew as many inches. The same year I had fine old plants of the same kind coming into bearing; they flourished equally both in the wood and in the fruit; and when all the others were more or less affected with the black spot on the grapes, these entirely escaped, and had no appearance of either of the diseases, and they have continued equally flourishing and healthy ever since; which has fully convinced me of the propriety of giving up the culture of all the others, and of planting this sort only, of which I have now forty rods planted out, where I intend to plant my vineyard; and I have remaining all the others which I had planted previous to my observation on the healthy kind; and that I may leave nothing untried in my power, I have this year raised more than two hundred young plants from the seeds of the fruit I had ripe last year of the fine bearing vines; some of which will, without doubt, be much more assimilated to the nature of the climate (of which they will be the actual offspring) than any other sort now growing.

From the best information I can procure, the vine I have spoken so highly of I believe to be the claret grape.

Brush Farm,
SIR; Nov. 28, 1819.

THE inclosed papers, relating to the culture of the vine, consist of copies of such letters as have passed on the subject at different periods, with his excellency governor Macquarrie. A memorial addressed to himself; a memorial to his majesty's secretary of state for the colonies, on the same subject, written as suggested by a letter received from his excellency's secretary (Paper No. 4), and offered to be forwarded by himself in the year 1816; also a statement made in the year 1818, on the progress made in the undertaking, with his excellency's answer: to which papers I beg to refer you for the principal information in my power to afford on the subject, and shall, for that reason, confine myself in this letter to such circumstances as are not mentioned in them; or respecting which, from farther experience, I have had reason to change my opinion.

The same sort mentioned in my statement (Paper No. 9) still continues equally flourishing, and the other sorts are much more diseased and blighted this year than I ever noticed them.

I have reason to believe that trenching the ground is not of so much consequence as at one time I was induced to think, where there is a sufficient depth of soil it may be prejudicial.

I have formed an opinion that the sort I have selected is much healthier than the other sorts, because it is a younger plant, raised from seed not many years back, compared with the others; which idea is supported by a treatise on the apple and pear, written by Mr. Knight, to which I refer you for some weighty arguments in its favour. I am farther confirmed in this opinion from the similarity of the state of the vines in America, in the year 1802, with most of them in this colony at this present time; which is particularly described in a narrative given me by a gentleman, written by Jean Jaques Dufour, who appears to have perfected the culture of the vine in that country. I have not inclosed a copy of the narrative, as I suppose you have seen it.

I remain, Sir,
&c. &c. &c.
G. Blaxland.

The Honourable Commissioner of Inquiry,
John T. Bigge, Esq.

APPENDIX.

N° I.

The following Letter has been received from Mr. HOLDITCH, *of Lynn, in continuation of his former Communication in* Vol. XL, p. 61.

Lynn,
Aug. 4, 1823.

SIR;

I BEG leave to inform you that I have erected a beacon similar to the one upon the Long Sand, of which you have a model, upon an island of sand called the Whiting Sand; the height, size, braces, chains, and stones, of nearly the same dimensions, with the following improvements, viz.

Instead of the triangle with seats upon the top, I have a round top, 6 feet diameter, and *railed round*, with a triangular vane of 2 feet each way, which shows that size from every point of the compass; and also a small seat *under* the top, to hold 3 persons occasionally: the beacon shows itself at 3 or 4 miles distant, like a sloop riding at anchor.

The Whiting Sand, where the beacon stands, is 12 miles from Hunstanton Cliff, and 7 miles from Terrington Steep, (*i. e.*) the *nearest* land, and 14 miles from Lynn town, and will preserve 10 men, if required, or more.

I am, Sir,
&c. &c. &c.
G. HOLDITCH.

To A. Aikin, Esq.
Secretary, &c. &c.

N° II.

EXTRACT OF MIMOSA-BARK, FOR THE USE OF TANNERS.

In April last the Society received a letter from R. Wilmot Horton, esq. Under-secretary of State for the Colonies, requesting them to take into consideration the probable value, with reference to the Manufactures and Commerce of the country, of a new material for tanning, recently imported from New South Wales by Mr. T. Kent.

A Committee of Colonies and Trade was accordingly appointed to investigate the subject.

It appears that, in consequence of the great extension of the British trade with South America, the importation of hides (that being the article in which a considerable proportion of the returns are made) has of late years greatly increased.

The excellence of British leather is fully acknowledged on the continent, and therefore it might be expected that the South American hides imported would be all tanned here, and re-exported in the state of leather. This, however, is far from being the case: many thousand hides are sent from London and other British ports to the continent of Europe in a raw state, after having remained for a longer or shorter time in the merchant's warehouses, producing no profit, and incessantly exposed to damage from weevils and other vermin.

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There are two causes (according to the testimony of the tanners who attended the committee) which occasion this unsatisfactory state of things; first, the regulations of the Excise, which forbid an union in the same persons of the businesses of tanning and currying; and secondly, a deficiency of tanning materials. Bark, being a very bulky article, will not bear the expense of freight from distant foreign countries, and the oak being a tree of slow growth, it has not been possible to increase our domestic supply of this article in proportion to the demand, although its high price has, in many instances, tempted landholders to sacrifice the future value of flourishing plantations to the present profit arising from the bark. By this improvident anticipation, however, the supply of oak timber for naval and other purposes is continually diminishing, and the most effectual defence of the country may, in the next generation, experience insuperable difficulties on this account.

During the last year or two, establishments have been formed in Dalmatia, and in other parts of the European continent that abound in forests of oak, for the purpose of condensing into the form of a soft or solid extract the active principles of oak-bark, and thus by materially diminishing the cost of freight to enlarge the range of supply. With the same object in view, Mr. Kent, at that time a resident in the colony of New South Wales, was employing himself in experiments in preparing an extract from the bark of two species of Mimosa, natives of that country, which bark is in common use at Sydney and other places as a material for tanning.

Specimens of this extract were given by Mr. Kent to Mr. Bigge, the commissioner for inquiring into the state of the colony, and soon after, Mr. Kent himself returned to England bringing with him above two tons of the extract prepared by him: this extract it was which formed the subject of inquiry.

It appears, from evidence before the committee, not only that all the oak-bark grown in this country is purchased by the tanners, but that considerable importations of foreign oak-bark take place, to the amount of about 10,000 tons per annum. Of this nearly the whole is used by the tanners who live in London and other places on the coast; and of the whole quantity of bark employed in London and its immediate vicinity, nearly four-fifths are foreign bark, exported from the opposite coast of France and Flanders, and selling at the price of about 14*l.* per ton.

The quality of leather is estimated in a considerable degree from its colour, the paler it is, the better price it bears in the market. The importance, however, of this character has been greatly over-rated; for, although it be true that bark which is old and has been injured by fermentation, will produce a brown leather, brittle, and of bad quality, yet it by no means necessarily follows, that dark-coloured leather is therefore inferior in any of those properties in which the real value of this substance consists.

The bark of the alder and of the larch are each of them capable of converting skin into excellent leather, but on account of the reddish brown colour of such leather, it is very difficult of sale. A similar objection applies, in a greater or less degree, to leather prepared by the extract either of oak-bark or of Mimosa-bark; but as from the testimony of professional persons, and from an examination of the specimens produced before the committee, the colour appears, in these cases, to be no indication whatever of inferiority, there is good reason to expect that this prejudice, as far at least as it is prejudice, may in time be overcome.

From experiments made by Mr. Brewin of Bermondsey, and by other tanners, it appears that a given weight of the extract of Mimosa will produce as much leather as from four to five times its weight of oak-bark of fair average quality. It is, therefore, not quite equal in strength to the extract of oak-bark. The comparative price, however, of the two, more than counterbalances this inferiority, for, notwithstanding the cost of freight from so distant a country as New South Wales, the expense of bringing it to market must, upon the whole, continue to be very moderate as long as the Mimosa trees shall be cut down for the purpose of clearing for cultivation the land on which they spontaneously grow.

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MR. J. W. JESTON'S Improved Mode of collecting the Juice of the Opium Poppy. See page 17.

IN POLITE ARTS.—CLASS II.

Mr. James Harris's Syringe to preserve Oil Paint in. See page 80.

Mr. Brockedon's Rest for Painters. See page 84.

Specimen of Mr. W. Deeble's Method of taking Casts of Leaves and Foliage. See page 95.

IN CHEMISTRY AND MINERALOGY.—CLASS III.

Mr. James Marsh's Portable Electro-Magnetic Apparatus. See page 47.

Mr. H. Marshall's improved Melting Pots for Brass-founders and Steel-makers. See page 52.

Mr. J. T. Cooper's Improvements in the Apparatus for analysing Vegetable and Animal Substances. See page 56.

Mr. J. T. Cooper's Hydrometer for Marine Solutions. See page 65.

Mr. G. Gurney's Oxy-hydrogen Blow-pipe. See page 70.

Mr. Thomas Griffiths' Test Papers prepared from Red Cabbage as a Test for Acids, &c. See page 78.

IN MECHANICS.—CLASS IV.

Mr. C. A. Siebe's Tap for Hollow Screws. See page 115.

Mr. E. Pechey's Mangle. See page 118.

Mr. E. Speer's Centrifugal Check-hooks. See page 121.

Mr. R. S. Wilkinson's Marine Arm Chest. See page 122.

Mr. James Amesbury's Apparatus to be applied in Cases of Fracture of the Lower Limbs. See page 124.

Mr. W. Raynes's Cap for Fractured or Dislocated Patella. See page 160.

Mr. James Jones's Kiln for Drying Grain. See page 165.

Mr. James Dennett's Apparatus for Baling Ships. See page 179.

Captain Dansey's Kite for effecting a Communication between a Stranded Ship and the Shore. See page 182.

Mr. J. Evans's Method of equalising the Strain on Tackles. See page 190.

Mr. J. Elliott's Apparatus for the Use of Dry-Grinders. See page 194.

Lieut. W. P. Green's improved Mode of Rigging. See page 198.

IN MANUFACTURES.—CLASS V.

Mr. W. V. Shenton's improved Engine for Tramming Silk. See page 109.

Mr. W. Cobbett's Plat for English Grass. See page 98.

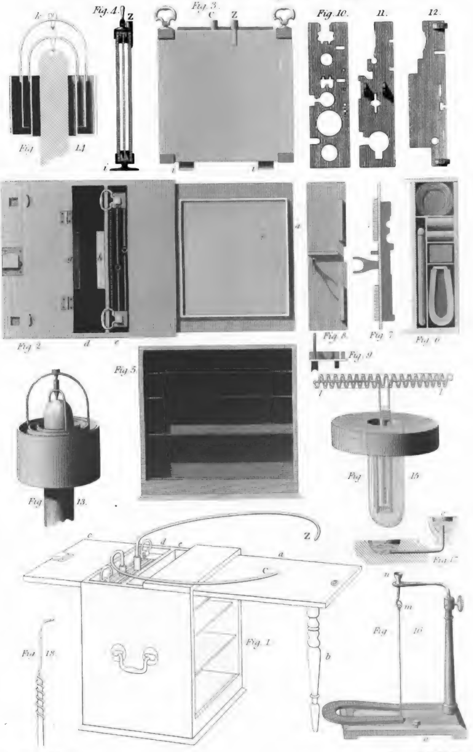
◆

LIST OF PLATES.

1. Mr. Marsh's Electro-magnetic Apparatus.
2. Mr. Cooper's Apparatus for Analysis.
    Do.'s Hydrometer.
3. Mr. Cooper's Hydrometer.
4. 5. Mr. Gurney's Oxy-hydrogen Blow-pipe.
6. Mr. Harris's Syringe for Painters.
    Mr. Siebe's Tap for Screws.
7. Mr. Brockedon's Painters' Rest.
    Mr. Dennet's Apparatus for Baling Ships.
8. Mr. Shenton's Tramming Engine.
9. Mr. Pechey's Mangle.
10. Mr. Speer's Centrifugal Check-hooks.
    Capt. Wilkinson's Marine Arm-chest.
11. Mr. Amesbury's Apparatus for Fractured Limbs.
12. Mr. Raynes's Cap for Fractured Patella.
13. Mr. Jones's Kiln for Drying Grain.
14. Capt. Dansey's Kite.
15. Mr. Evans's Combination of Tackles.
16. Mr. Elliott's Apparatus for Dry-Grinders.
    Lieut. Green's Improvements in Rigging Ships.

T. C. Hansard, Paternoster-row Press.

Mr. James Marsh's Electro-Magnetic Apparatus.



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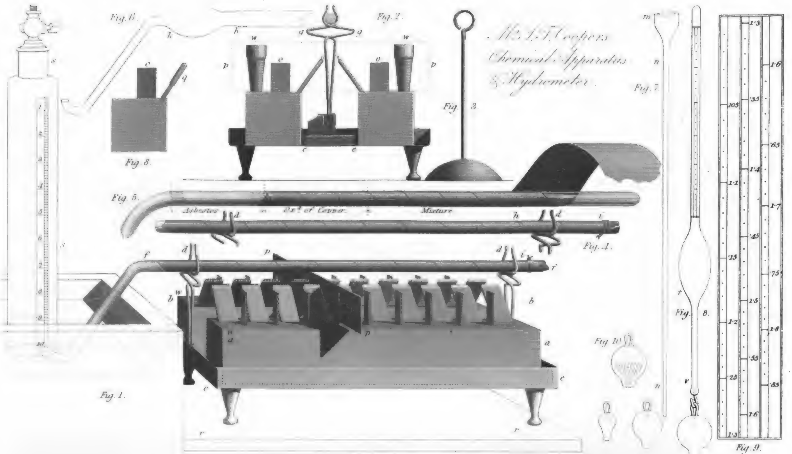
Engraved by J. B. Taylor

PLATE II.



Mr. J. T. Cooper's
Chemical Apparatus
& Hydrometer.

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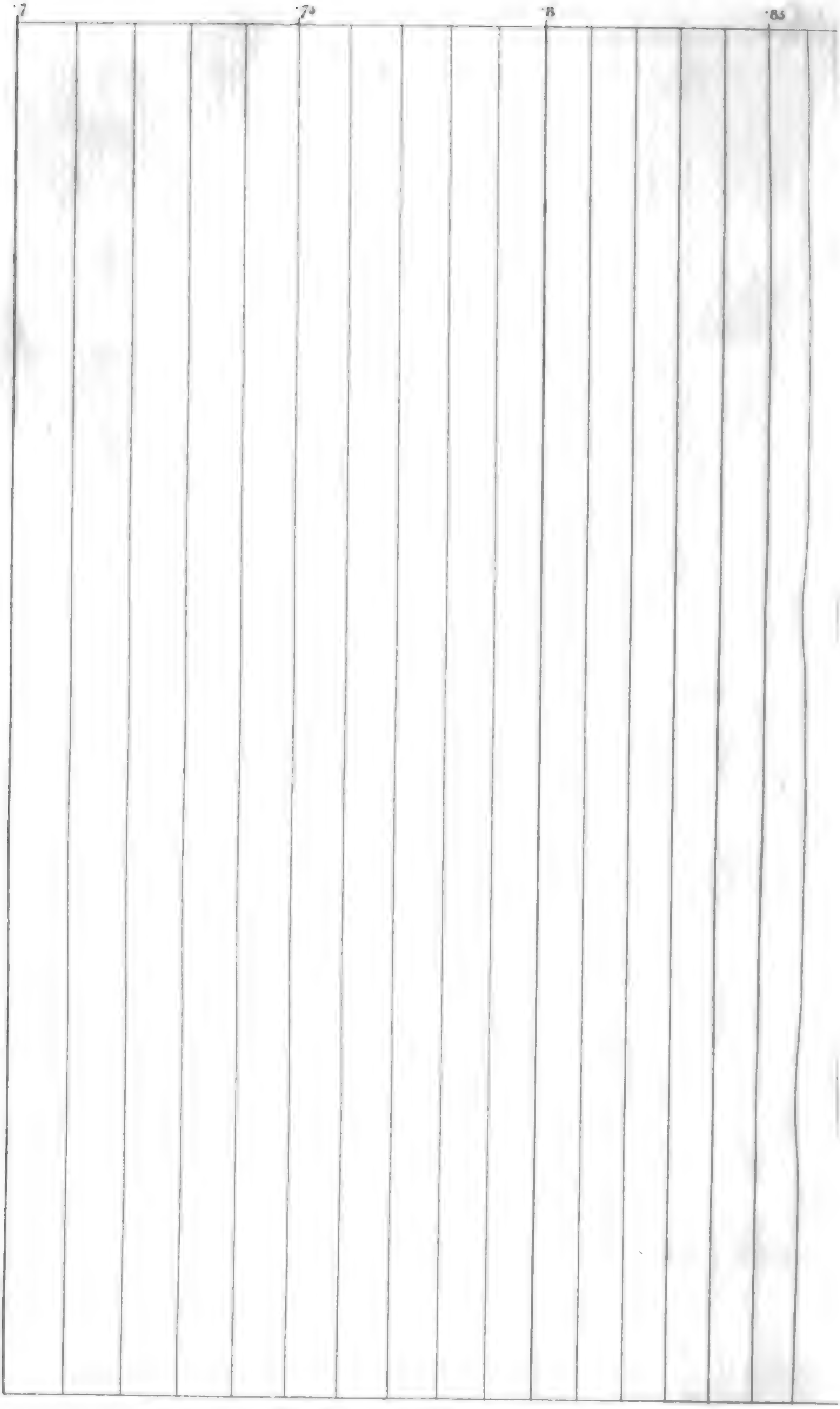

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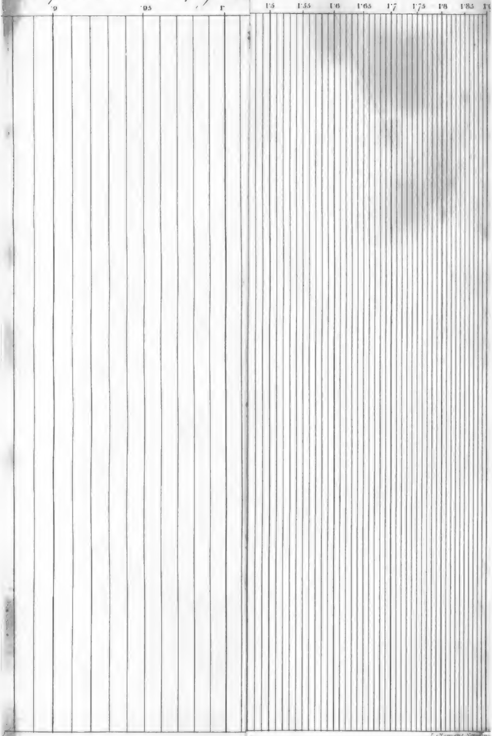
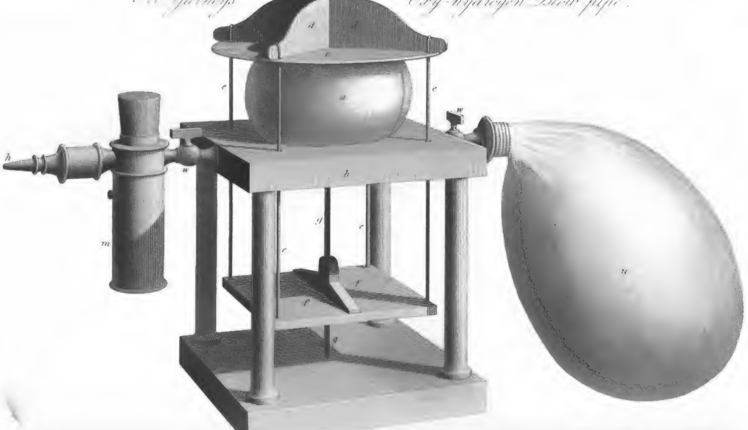
Cooper's method of grad

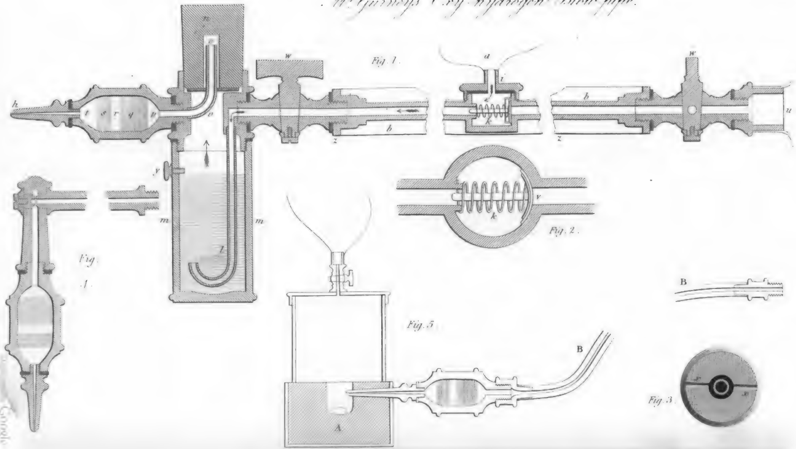


J. Clement, Sc

Mr Gurneys Oxy-hydrogen Blow-pipe.

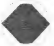


Mr Gurney's Oxy-hydrogen Blow-pipe.



Mr. Seibe's Universal Screw Taps.

Fig. 8.



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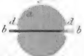

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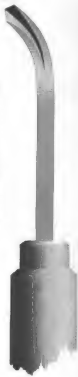

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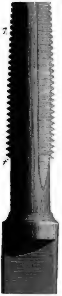

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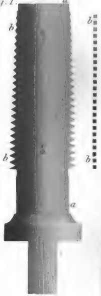

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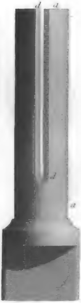
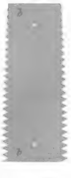
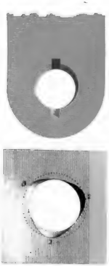


Fig. 3.





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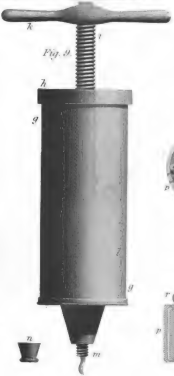

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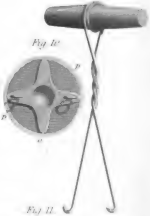
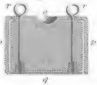


Fig. 11.



Mr. J. Harris's Syringe.

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Mr Dennett's Apparatus for baling Ships

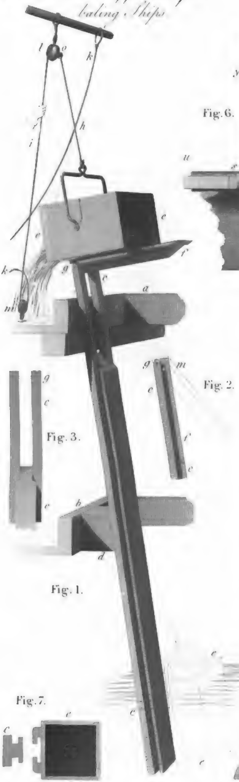
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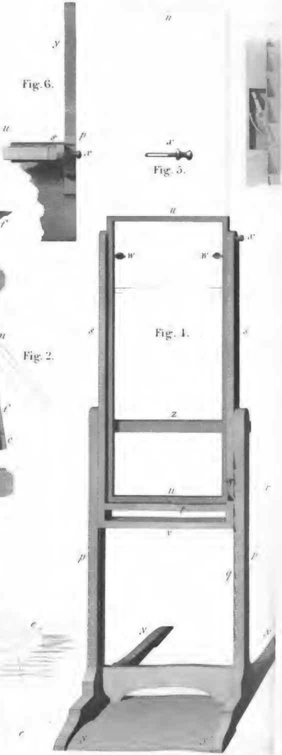
Fig. 3.
Fig. 7.

Mr Brockedon's rest for Painters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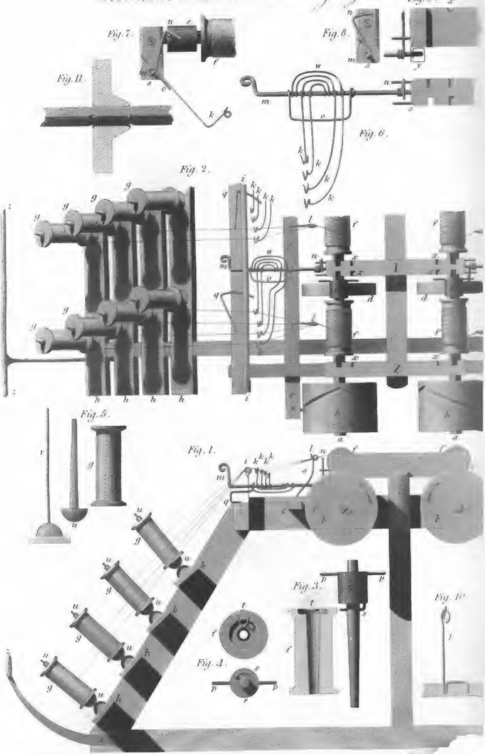
Cornelius Varley. del.

T. Bradley

Mr. W. H. Shenton's Tramming Engine.



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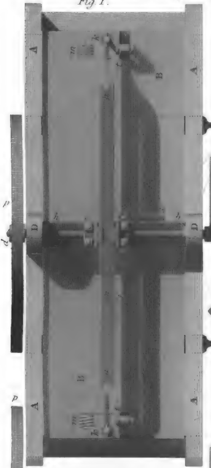
Mr. E. Pechey's Mangle.

Fig. 1.



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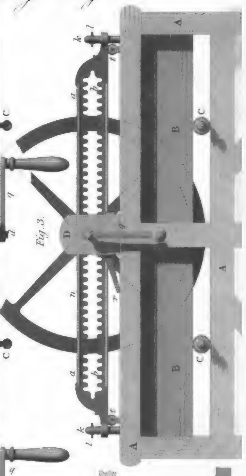

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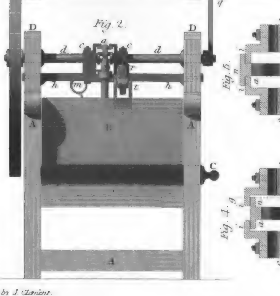

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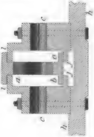

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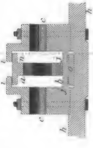

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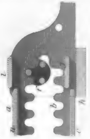

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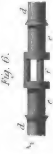

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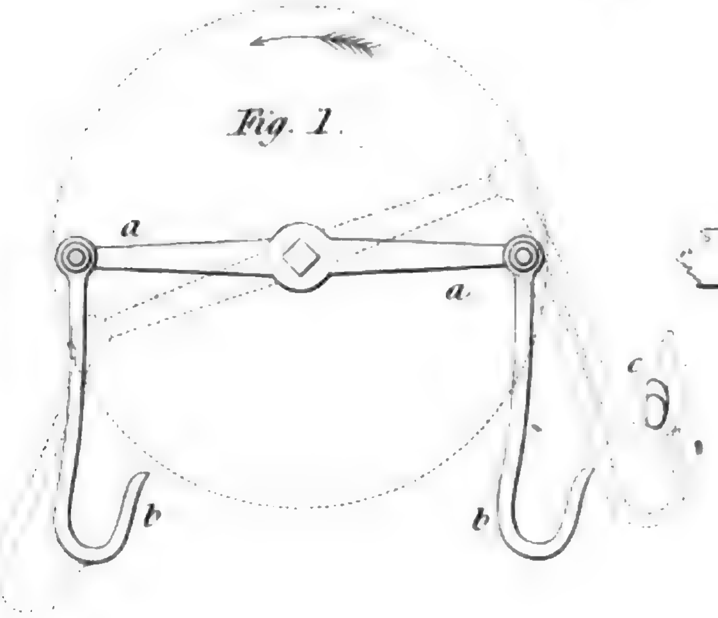
Mr Edward Speer's Centrifugal Check-hooks.

Fig. 1.



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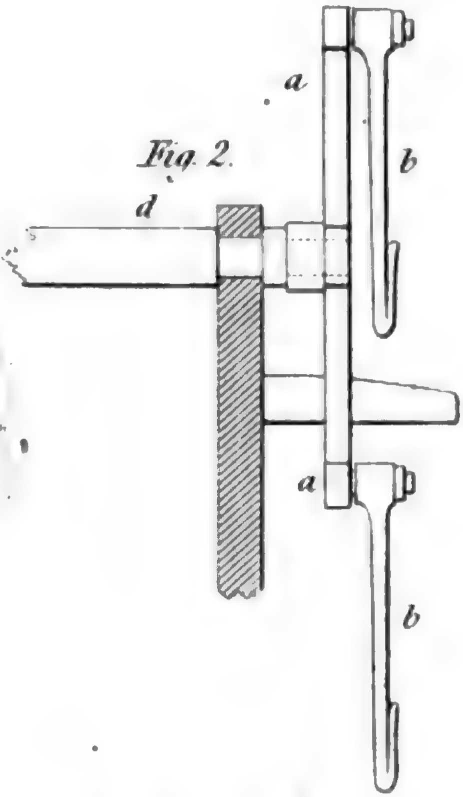
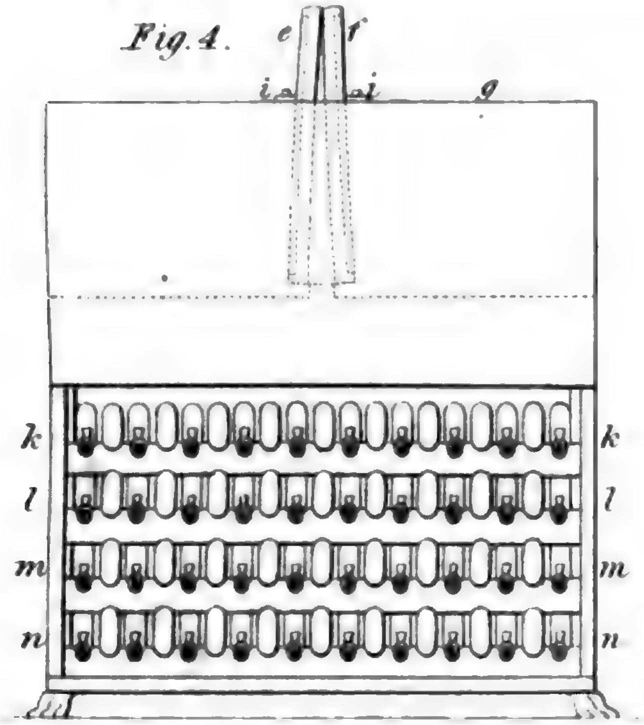


Captn R. S. Wilkinson's Marine Arm Chest.

Fig. 4.



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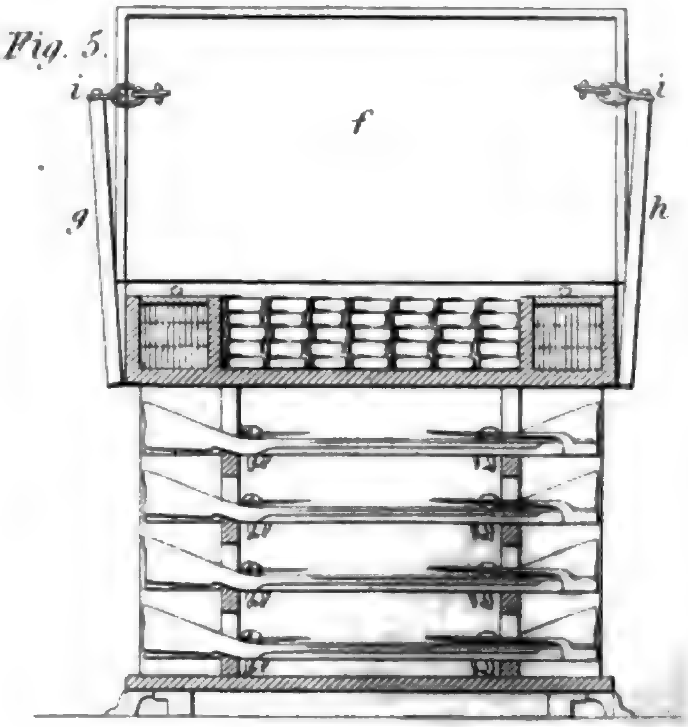

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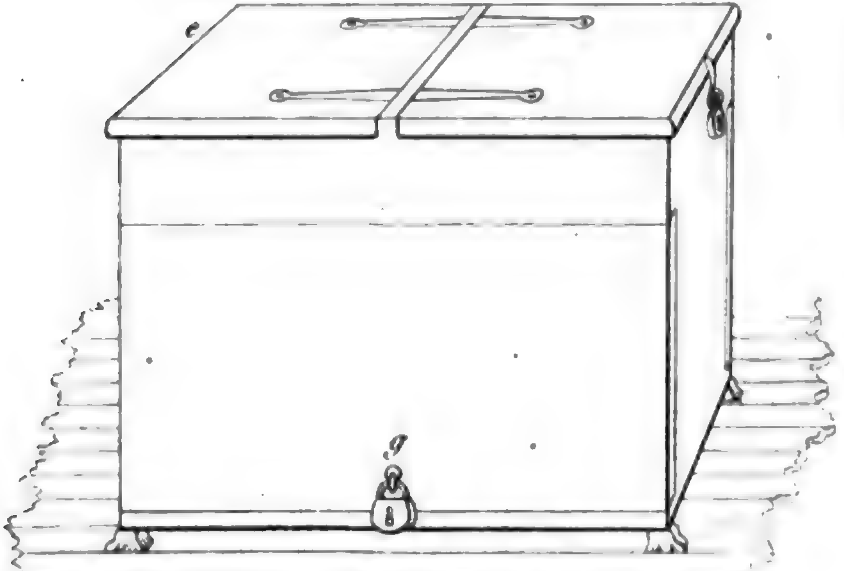

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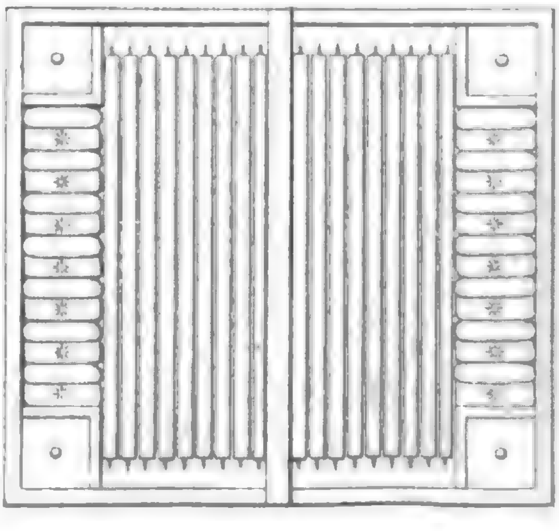

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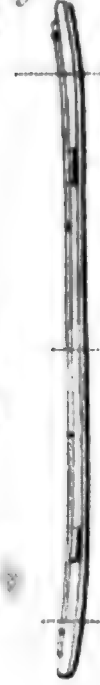
Mr J. Amesbury's

dislocations

Fig. 26.



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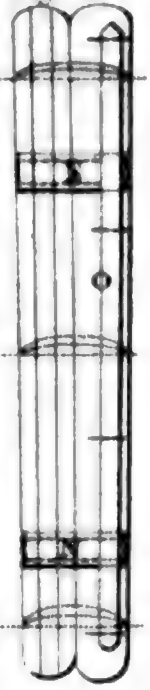

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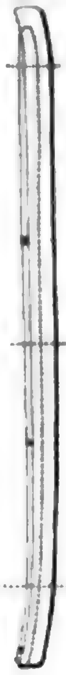

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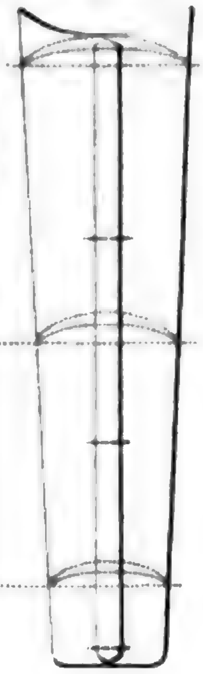

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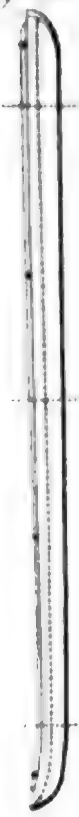

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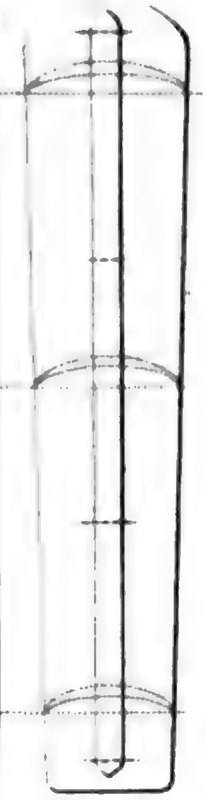

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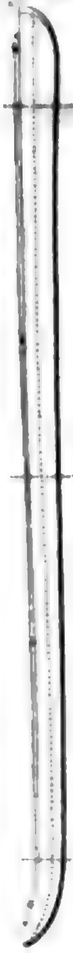

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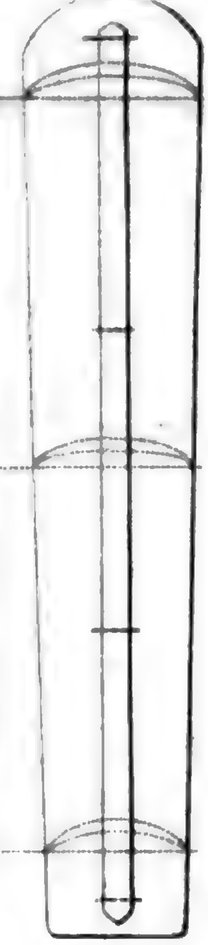

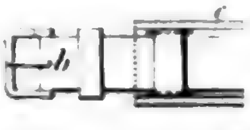

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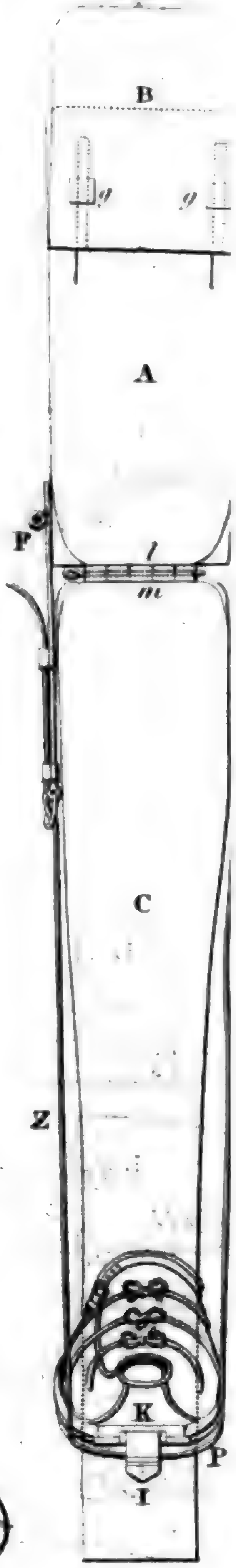

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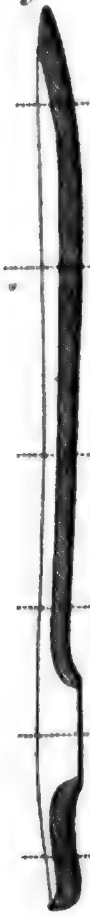

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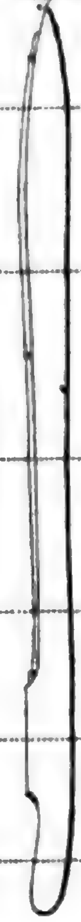

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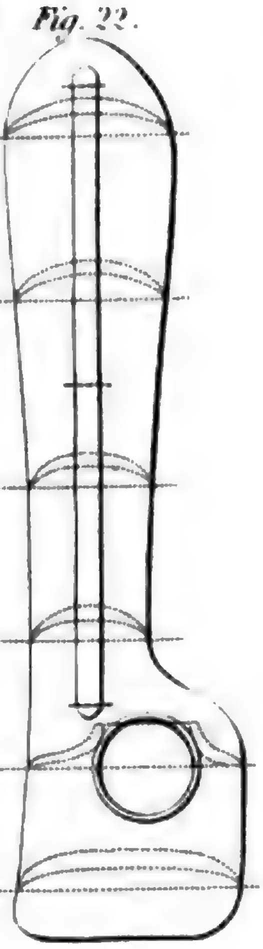

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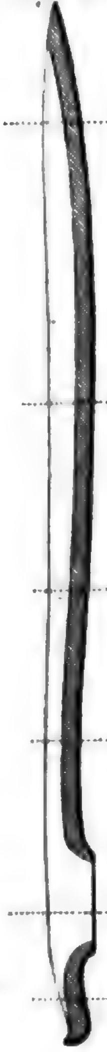

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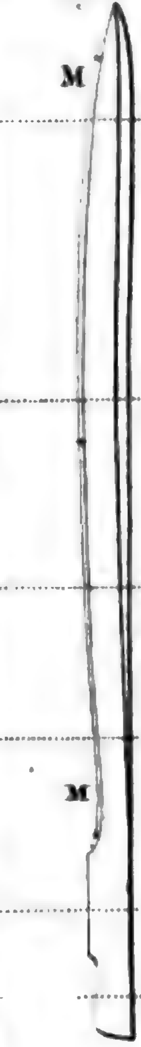

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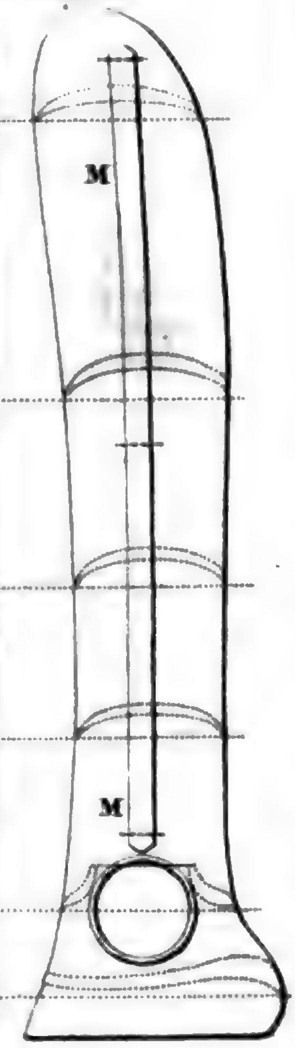

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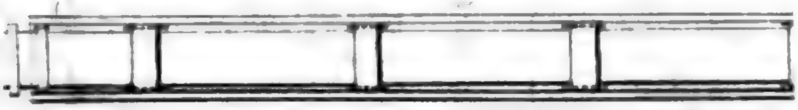

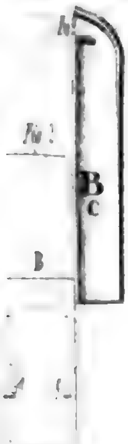

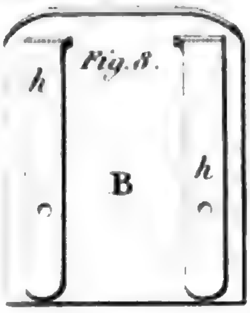
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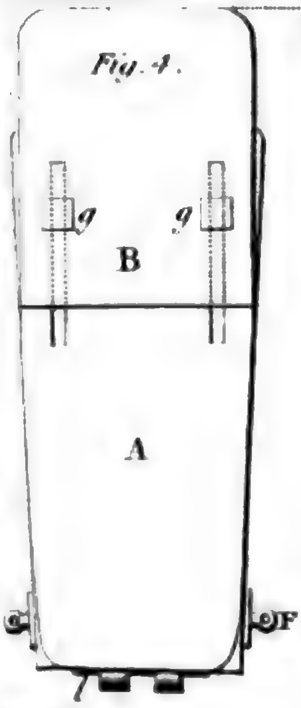
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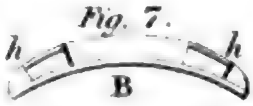
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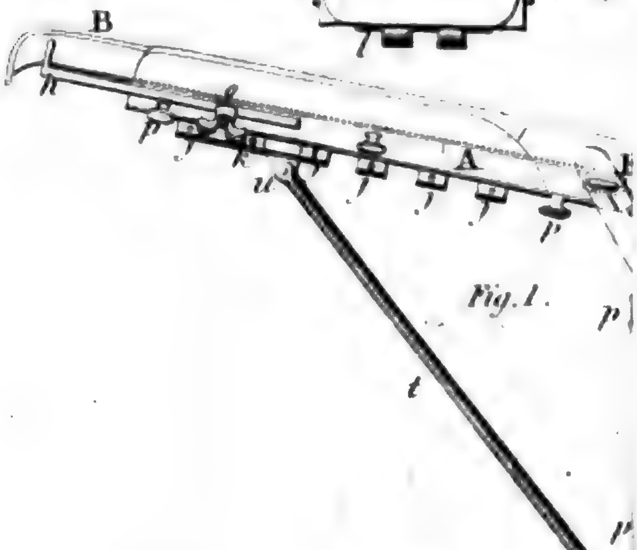
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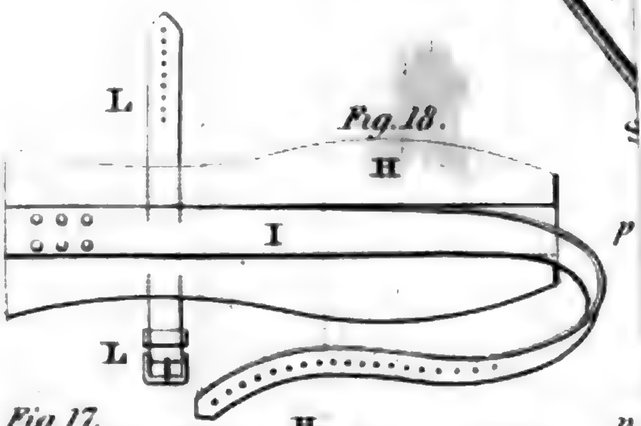
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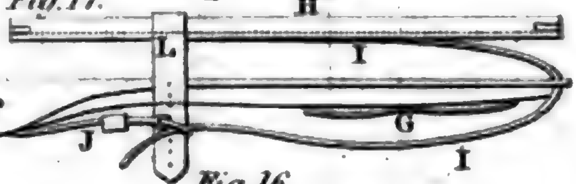
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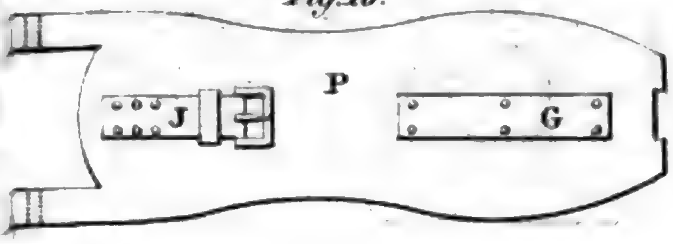
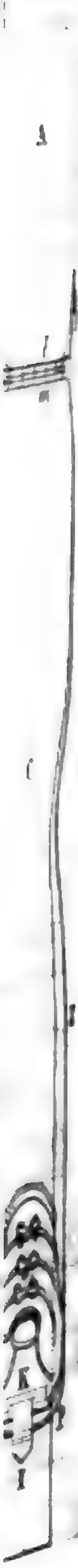
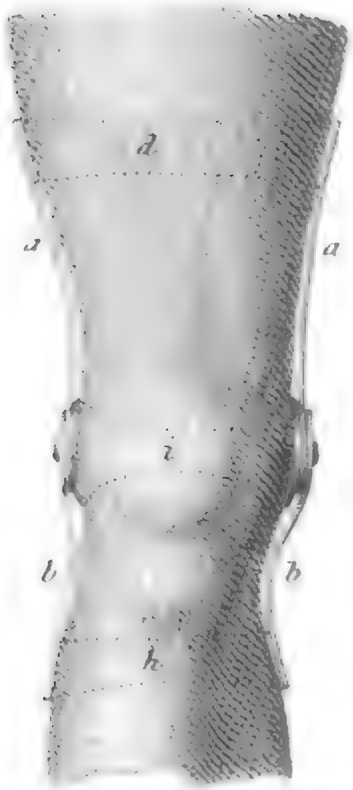


Fig. 16.



Mr. W

Fig. 5.



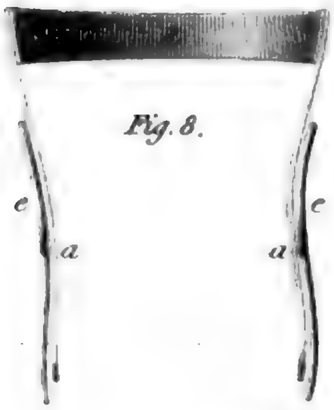
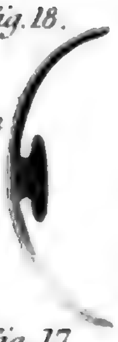


Fig. 8.

Fig. 18.



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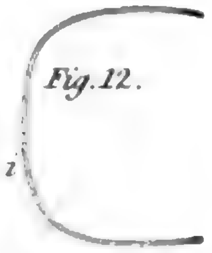

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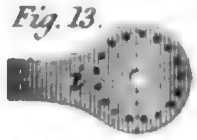

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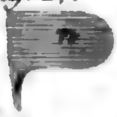

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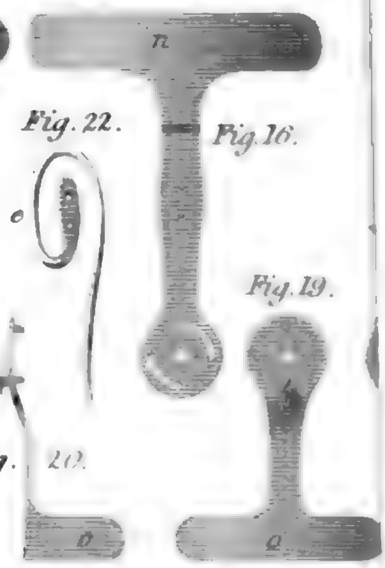


Fig 23.

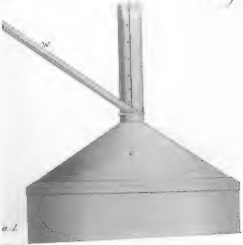
Fig. 22.

Fig. 19.

Fig. 20.

Fig. 21.

Drawn by J. Clement.



g. 1.

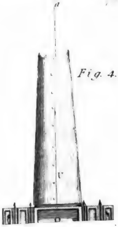


Fig. 4.

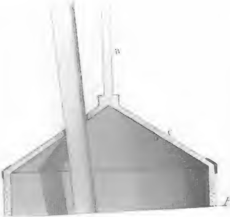
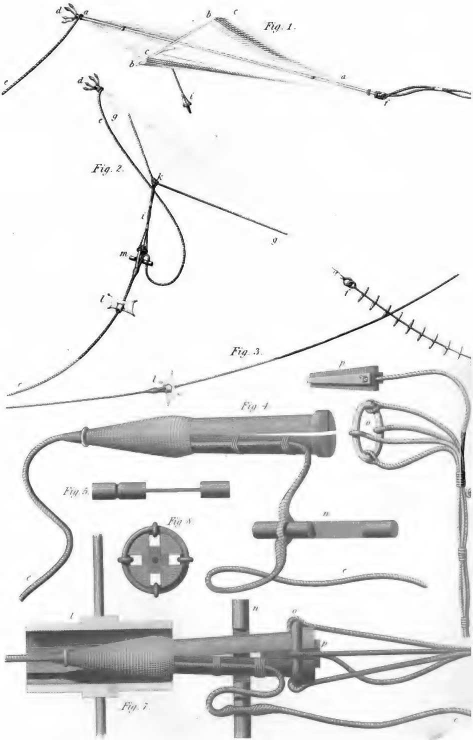


Fig. 2

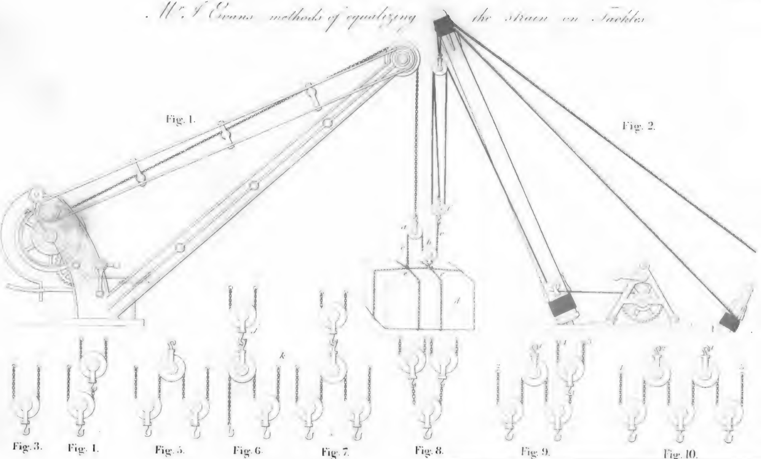
PLATE

Captn. Dancey's Kite for communicating between a veſsel & the shore.



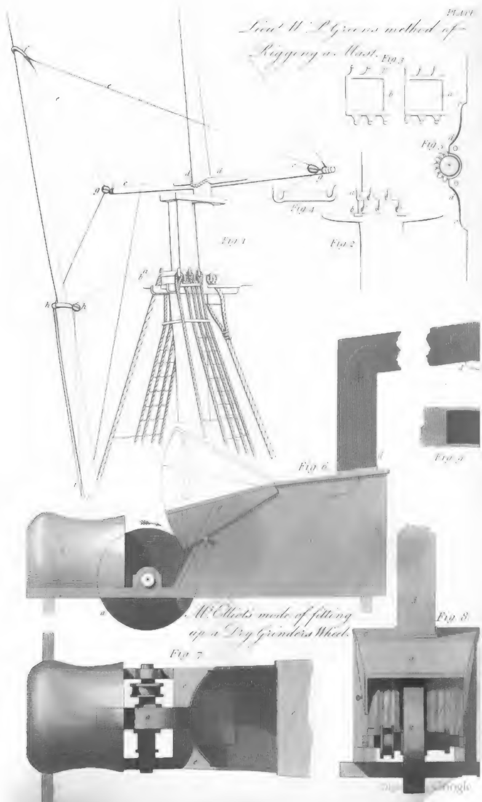
Drawn by H.W. Reveley.

Mr. J. Evans methods of equalizing the strain on Tackles



PLATE

Lieut W. L. Greens method of Rigging a Mast.



Mr Elliots mode of fitting up a Dry Grinders Wheel.

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Digitized

INDEX.

INDEX.

A

ADVERTISEMENT, general, describing the objects of the Society; the Meetings of the Society; the form for proposing Members; Ladies being eligible as Members to vote by Proxy at Elections; Members entitled to vote and assist in the business of the Society; their privilege of recommending two persons as visitors at the Meetings of the Society, and introducing their friends to examine the various Models, &c. iii; Members to have the use of the Society's Library; Invitation to Members and others to augment the Library by contributions; Form offered to persons inclined to leave Money to the Society by Will; The Society not responsible for any opinion, or representation of facts, contained in their Volumes; the Public requested to guard against impositions from persons advertising as having Patents for articles sold under the pretended sanction of the Society's name; Society's Publications; Manner of communicating, iv.

Agriculture, Conditions to guide Candidates in, vi.; Premiums in, vi. to xii.; Papers in, 1 to 46.

Amesbury, J. Esq., the Gold Vulcan Medal to, for an apparatus for fractures of the lower limbs, xl.; his Communication respecting, 124.

Analysis of Organic Products, Mr. J. T. Cooper's improved Apparatus for the, 56.

Arm Chest, Capt. Wilkinson's Communication on an, 122.

B.

Bailes, Mr. Henry, the Silver Isis Medal to, for a Carving of Flowers, xxxix.

Baker, Mr. W., the Silver Isis Medal to, for an Historical Subject, xxxix.

Baling Ships, the Large Silver Medal to Mr. James Dennett, for an Apparatus for, xl.

INDEX.

Barrett, Mr. T., the Silver Palette to, for an Historical Subject, xxxix.

Bassett, Mr. H., the Gold Isis Medal to, for a Design for a British Museum, xxxix.

Baynton, Mr. T., the Silver Isis Medal to, for a Landscape, xxxviii.

Blaxland, Mr. Gregory, the Large Silver Medal to, for Wine, the produce of his Vineyard in New South Wales, xl.; his Communication respecting, 285

Blow-Pipe, Mr. G., Gurney's Oxy-Hydrogen, 70.

Bowley, Miss, her painting of flowers exhibited, xl.

Brockedon, Wm. Esq., the Silver Isis Medal to, for a Rest for Painters, xl.; his Communication respecting, 84.

Bunning, Mr. C. H., the Silver Palette to, for an Historical Subject, xxxviii.

C

Cahusac, Mr. J. A., the Silver Palette to, for a Drawing, xxxviii.

Candidates, General Notice to, v.

Cap for fractured or dislocated Patella, Mr. W. Raynes's Communication on a, 160.

Cecil, Mr. S. W., the Large Silver Medal to, for a Drawing of an Anatomical Figure, xxxix.

Centrifugal Check-hooks, Mr. Speer's Communication on, 121.

Chemistry, Dyeing, and Mineralogy, Premiums in, xii to xviii.

Clark, Miss Eliz., the Large Silver Medal to, for an Historical Subject, xxxix.

Cobbett, Mr. W., the Large Silver Medal to, for Plat from English Grass, xl.; his Communication respecting, 98.

Colonies and Trade, Premiums in xxxii to xxxvii.

Cooper, Mr. J. T., the Large Silver Medal to, for his improvements in the Apparatus for analysing vegetable and animal substances, xxxviii.; his Communication respecting, 56.

——————— the Gold Vulcan Medal to, for a Hydrometer for Saline Solutions, xxxviii.; his Communication respecting, 65.

Corbet, Mr. Phil., the Large Silver Medal to, for a Drawing from a Statue, xxxix.

Corbet, Mr. Philip, his drawing of the Gladiator exhibited, xl.

Cowley and Staines, Messrs., Thirty Guineas to, for preparing 143lbs. of Opium from Poppies grown in England, xxxvii.; his Communication respecting, 15.

Cox, Miss Sarah, the Silver Isis Medal to, for a Drawing of a Bust, xxxix.

D.

Dalton, Mr. Edwin, his Copy of a Miniature exhibited, xl.

Dansey, Captain, the Gold Vulcan Medal to, for his Mode of communicating with Vessels stranded on a Lee-shore, xl.; his Papers respecting, 182.

Deare, Mr. Jos., the Silver Isis Medal to, for a Model of Bacchus, xxxix.

Deeble, Mr. W., the Silver Isis Medal to, for his Method of taking Casts of Leaves, &c. xl.; his Communication respecting, 95.

Dennett, Mr. James, the Large Silver Medal to, for an Apparatus for Baling Ships, xl.; his Communication on the subject, 179.

Denovan, Mr. J. F., the Sum of Fifty Guineas to, for the continued zeal and success with which he has entered into competion with the Dutch, in the early supply of the Hamburgh Market with Pickled Herrings, xl.; his Communication respecting, 201.

Desvignes, Mr. P. H., the Silver Palette to, for a Drawing from a Bust, xxxix.

——— the Silver Isis Medal to, for a Drawing, xxxix.

Drummond, Miss Jane, the Silver Isis Medal to, for a Portrait, xxxviii.

——— Miss Rose Emma, the Large Silver Medal to, for an Historical Composition, xxxviii.

——— Mr. S., the Large Silver Medal to, for an Historical Subject, xxxviii.

——— Miss Eliza Anne, the Silver Isis Medal to, for an Historical Composition, xxxviii.

Dry-Grinders, the Gold Vulcan Medal to Mr. J. Elliott, for his Safety Apparatus for, xl.

INDEX.

E.

Edwards, Mr. Ed., the Large Silver Medal to, for a Model in the Round of a Groupe, xxxix.

——— the Gold Isis Medal to, for a Groupe, xxxix.

Eddy, Miss F., the Silver Isis Medal to, for a Composition of Flowers, xxxviii.

Elliott, Mr. J., the Gold Vulcan Medal to, for a Safety Apparatus for Dry-Grinders, xl. His Communication respecting, 194.

Engraving on Steel Plate, Mr. C. Warren's Communication on, 88.

Evans, Mr. J., the Large Silver Medal to, for his Method of Regulating the Strain upon Tackles, xl. His Communication respecting, 190.

F.

Fairland, Mr. T., the Large Silver Medal to, for a Drawing from a Figure, xxxiv.

Fine Plat, M. W. Cobbett's Communication on, 98.

Forest Trees, Communication from Lieut.-Col. Wildman on Planting, 1.

——— Communication from Captain Hawkins, 7.

Fractures of the Lower Limbs, Mr. Amesbury's Communication on an Apparatus for, 124.

G.

Gilbert, Mr. Jos. Miles, the Silver Isis Medal to, for a Marine Painting, xxxviii.

Griffiths, Mr. Thos., the Thanks of the Society to, for his Communication on the Use of the Colouring Matter of Red Cabbage as a Test for Acids, &c. &c., 78.

Green, Lieut. Wm. Pringle, the Silver Vulcan Medal to, for Improvements in the Rigging of Ships, and his Communication respecting, 198.

Gurney, Mr. G., the Gold Vulcan Medal to, for an Oxy-hydrogen Blow-pipe, xxxviii; his Communication respecting, 70.

Gwilt, Mr. G. jun., his Drawing of the Altar Screen of St. Saviour's Church, Southwark, exhibited, xl.

H.

Hale, Miss Mary Anne, her Copy of a Miniature exhibited, xl.

Harris, Mr. James, the Large Silver Medal and Ten Guineas to, for a Syringe to preserve Oil Paint in, xxxix; his Communication respecting, 80.

Hawkins, Capt., the Thanks of the Society to, for a Communication respecting a Plantation of Forest Trees, 7.

——————— Special Thanks of the Society to, for his Plantations of Forest Trees, xl.

Herrings, the Sum of Fifty Guineas to Mr. J. F. Denovan, for the early supply of the Hamburgh Market with Pickled Herrings, 201.

Hilditch, Mr. R. H., the Large Silver Medal to, for a Landscape, xxxviii.

——— Mr. G., jun., the Gold Isis Medal to, for a Landscape, xxxviii.

Hopkins, Miss Ann, the Silver Palette to, for a Landscape, xxxix.

Horse-Beans, Communication from W. P. Taunton, Esq., on an early variety of, 31.

Hull, Miss Mary Jane, the Silver Isis Medal to, for a Portrait, xxxviii.

Hydrometer for Saline Solutions, Mr. J. T. Cooper's, 65.

J.

Jeston, J. W. Esq., the Large Silver Medal to, for his Improved Mode of collecting the Juice of the Opium Poppy, xxxvii; his Communication respecting, 17.

Johnson, Mr. H., the Large Silver Medal to, for an Historical Composition, xxxviii.

Jones, Mr. James, the Large Gold Medal to, for a Vertical Kiln, for drying Corn, xl; his Communication respecting, 165.

——, Mr. T., Special Thanks of the Society to, for his Guard to the Wheels of Waggons, xl.

K.

Kiln for Drying Corn, the Large Gold Medal to Mr. James Jones, for a Vertical, xl.

L.

Lawson, Mr. J. H., the Silver Palette to, for a Portrait, xxxviii.

M.

Magnetic Apparatus, Mr. James Marsh's Portable Electro, 47.

Mangle, Mr. Elisha Pechey's Improved, 118.

Manufactures, Premiums in, xxvii to xxix.

Marbles, on exposing Specimens of British, xxxvii.

Marsh, Mr. James, the Large Silver Medal and Thirty Guineas to, for a Portable Electro-Magnetic Apparatus, xxxvii; his Communication respecting, 47.

Marshall, Mr. H., the Large Silver Medal to, for Improved Melting Pots for Brass-founders and Steel-makers, xxxvii; his Communication respecting, 52.

Mechanics, Premiums in, xxix to xxxii.

Melting Pots, Mr. H. Marshall's Improved, 52.

Middleton, Mr. J. G., the Large Silver Medal to, for a Portrait, xxxviii.

Mills, Mr. G., the Gold Vulcan Medal to, for a New Die of the Vulcan Medal presented by him, xl.

N.

Nicholl, Mr., the Gold Isis Medal to, for a Carving in Wood of a Figure, xxxix.

INDEX.

O.

Opium, Communication from Messrs. Cowley and Staines on English, 15.

——— Communication from J. W. Jeston, Esq., on collecting the Juice of, 17.

P.

Padgett, Mr. J., the Large Silver Medal to, for a Drawing of a Bust, xxxix.

——— Mr. J., his Drawing of a Gladiator exhibited, xl.

Painter's Rest, Mr. W. Brockedon's Communication on a, 84.

Pearsall, Mr. H., the Silver Isis Medal to, for a Landscape, xxxviii.

Pechey, Mr. E., the Silver Vulcan Medal and Ten Guineas to, for a Mangle, xl; his Communication respecting, 118.

Physick, Mr. Ed. G., the Large Silver Medal to, for two single Figures, xxxix.

Planting Forest Trees, Lieut.-col. Wildman's Communication on, 1.

Plat, Seed of the Grass employed in making fine, viii.

Polite Arts, Performances in the Class of, exhibited on account of their merit, &c. xl.

————, Premiums in, xix to xxvii.

Porter, Mr. J., the Silver Isis Medal to, for an Historical Composition, xxxviii.

Presents, 295.

Preserving Oil Colours, Mr. J. Harris's Communication on a Method of, 80.

Purser, Mr. C., the Gold Medallion to, for an Original Design for a British Museum, xxxix.

R.

Raynes, Mr. N., the Silver Vulcan Medal and Ten Guineas to, for a Cap for fractured Patella, xl; his communication respecting, 160.

Richmond, Mr. T., the Silver Isis Medal to, for a Portrait, xxxviii.

Robson, Miss, the Silver Isis Medal to, for a Composition of Flowers, xxxviii.

Rochard, Mr. Frederick, the Silver Isis Medal to, for a Portrait, xxxviii.

———, Mr. F., the Silver Isis Medal to, for an Historical Subject, xxxviii.

Ross, Miss M., the Large Silver Medal to, for a Portrait, xxxviii.

Rowe, Miss, the Silver Isis Medal to, for an Historical Subject, xxxix.

S.

Shenton, Mr. W. V., the Silver Vulcan Medal to, for his Engine for Tramming Silk, xl; his Communication respecting, 109.

Siebe, Mr. C. A., the Silver Vulcan Medal and Five Guineas to, for a Tap for Hollow Screws, xl; his Communication respecting, 114.

Simpson, Mr. G., his Anatomical Drawing exhibited, xl.

——— Mr. P., the Gold Isis Medal to, for a Portrait, xxxviii.

Smith, Miss Matilda, the Large Silver Medal to, for a Portrait, xxxviii.

Solomon, Mr. J., the Large Silver Medal to, for the Laocoon, xxxix.

Speer, Ed. Esq., the Silver Vulcan Medal to, for his Centrifugal Hooks, xl; his Communication respecting, 121.

Stalker, Miss Jane, the Silver Isis Medal to, for a Drawing from a Bust, xxxix.

——— Mr. Ebenezer, the Silver Isis Medal to, for a Landscape, xxxix.

——— Mr. Ebenezer, the Silver Palette to, for a Drawing from a Bust, xxxix.

Strain on Tackles, the Large Silver Medal to Mr. J. Evans, for his Method of Regulating the, xl.

INDEX.

T.

Taking Casts of Leaves and Foliage, Mr. W. Deeble's Communication on, 95.

Tap for Cutting Hollow Screws, Mr. Siebe's Communication on, 115.

Taunton, W. Pyle, Esq., the Large Silver Medal to, for early Horse-beans, xxxvii; his Communication respecting, 31.

Teasdale, Mr. Mich., the Silver Palette to, for a Head, xxxix.

Test for Acids, Alkalies, and common Salts, Thanks of the Society to Mr. Thomas Griffiths, for his Communication on, 78.

Tramming Silk, Mr. W. V. Shenton's Communication on an Improved Engine for, 109.

V.

Vessels Stranded on a Lee Shore, the Gold Vulcan Medal to Captain Dansey, for a Mode of Communicating with, xl,

Vulley, Miss Louisa Mary, the Silver Isis Medal to, for a Head, xxxix.

W.

Ward, Mr. G. R., the Large Silver Medal to, for a Portrait, xxxviii.

Watts, Mr. F. W., the large Silver Medal to, for a Landscape, xxxviii.

Warren, G. Esq., the Large Gold Medal to, for his Improvements in the Art of Engraving on Steel Plate, xl; his Communication respecting, 88.

Wildman, Lieut.-Col., the Gold Ceres Medal to, for Planting Forest Trees, xxxvii; his Communication respecting, 1.

Wilkinson, R. S. Esq., the Large Silver Medal to, for a Marine Arm-Chest, xl; his Communication respecting, 122.

Williams, Mr. Evan, the Silver Isis Medal to, from a Drawing from a Bust, xxxix.

——— Mr. E., the Silver Isis Medal to, for a Drawing from an entire Figure, xxxix.

Willis, Miss Mary, the Large Silver Medal to, for a Composition of Flowers, xxxviii.

——— Miss Mary, the Silver Isis Medal to, for a Flower piece, xxxviii.

Wine, the Large Silver Medal to Mr. Gregory Blaxland, for the produce of Wine from his Vineyard in New South Wales, xl.

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CONTENTS.

Premiums offered in the session 1824-25 i
List of Officers of the Society ii
Advertisement to the public iii
General notice to candidates v
Rewards bestowed by the Society during the session 1823-24 xliv

AGRICULTURE.

Philip Hurd, Esq. on a Plantation of Oaks . . . 3
Henry Blyth, Esq. on embanking Land from the sea . . 5
Messrs. **Cowley** and **Staines** on British Opium . . . 9
Mr. **Salisbury** on the naturalization of the phormium tenax, or New Zealand flax 18

CHEMISTRY.

Mr. R. W. **Dickinson** on an apparatus for clearing Beer while in a state of fermentation 23
Mr. **Henry Wilkinson** on an improved Safety-chamber to the Oxy-hydrogen Blow-pipe 26
Mr. T. **Griffiths** on an improved Stop-cock for chemical purposes 29
Mr. G. **Chapman** on a method of consuming the Smoke of Steam-boiler Furnaces 32
Report on East Indian Annatto 39

POLITE ARTS.

Mr. Edmund Turrell on a Menstruum for biting-in on Steel Plate 43
Mr. J. Straker on a method of producing Embossed Designs on Wood 52
Notice respecting engraving in mezzotinto on Steel Plate 53
Mr. Joseph Fincher on a plan for preventing fraudulent Erasures in Bankers' Cheques . . . 58
On the Prevention of Forgery—by Mr. Ferguson . 60
by Mr. Lea . . 63
by Mr. Palmer . 65

MANUFACTURES.

D. Maclean, Esq. on Cloth manufactured entirely from wool the growth of the colony of New South Wales . 69
Hats or Bonnets of British manufacture in imitation of Leghorn 74
Mr. Peter Caron on a method of preventing the watering of Silks without the use of a Knee-roll . . 80

MECHANICS.

Mr. G. Gladwell on a Plane for Carpenters . . 83
Edward Speer, Esq. on concentric Chucks for Turners 86
Mr. Richard Soaper on a Ladle for paying the seams of vessels with pitch, and a Pitch-kettle . . 90
Lieut. W. P. Green, R. N. on a Gun-carriage and jointed Ramrod 93
Capt. G. G. Burton, R. N. on an improved method of letting go the Anchor 99
Mr. Raphael Clint on balanced or swinging Masts . 107

Mr. G. Smart on supporting the Topmasts of ships . 111
Lieut. W. J. T. Hood, R. N. on Screen-glasses for Quadrants and Sextants 115
Mr. F. Watt on a Screw-wrench . . . 121
Mr. Thomas Eddy on a Screw-wrench . . 123
Mr. J. Duce on a quadruple Lock for safe-chests, &c. . 125
Mr. G. Walsh on an original Screw . . . 127
Capt. T. M. Bagnold, R. M. on an improvement in the Steam Culinary apparatus 130
T. Bewley, Esq. on warming Manufactories . . . 134
Mr. J. Bothway on an apparatus for the use of Invalids 140
Mr. J. Aitkin on a Remontoire Escapement . . 142
Mr. R. W. Franklin on a self-acting Feeder for high-pressure Steam-boilers 146
Mr. F. Richman on a Truss for a sunken floor . 149
Mr. Alfred Ainger on cast-iron Trusses for sustaining decayed or sunken timbers 153
Mr. A. Westcott on a Magnetic-guard for needle-pointers 165
Mr. Stirling—a set of Working-drawings of a Steam-engine 167

COLONIES AND TRADE.

M. Chazal on Silk from the Isle of France . . 168
Mr. T. Kent on extract of Mimosa-bark . . 176
John M'Arthur, Esq. on fine Wool from New South Wales 178
Hannibal M'Arthur, Esq. on Wool from New South Wales 180
Robert Wilmot Horton, Esq.—sundry articles from New South Wales 188

APPENDIX.

Mr. SALISBURY on New Zealand flax . . 185
Mr. HARDY's clock 186

Presents received by the Society from Dec. 1823 to Dec. 1824 189
Catalogue of models, machines, &c. . . . 198
List of plates 201
List of contributing members . . . 203

PREFACE.

THE present volume contains, as usual, the detailed accounts (illustrated, where needful, by explanatory engravings) of all the useful inventions and meritorious exertions on subjects belonging to the polite or practical arts, which have been rewarded during the preceding session.

For the benefit of the public, and of those members who are prevented from habitual attendance on the meetings of the Society and of the committees, it has been customary to prefix a summary of the contents of the volume. This has been done for the purpose of placing in a clearer light, the annual contributions made by the Society to the common stock of useful knowledge, and also as affording an opportunity of giving such explanations respecting the motives which have actuated the Society in conferring their rewards, as any particular case may require.

In the Class of Agriculture and Rural Economy— The large gold medal of the Society has been voted to Philip Hurd, Esq., being the premium offered for planting oaks for timber.

The extent of Mr. Hurd's plantation is not large, but it is rendered interesting from its situation, being at the foot of Highgate-hill, and therefore, probably, the nearest of any to the metropolis. The acorns were selected with great care, and in a season very favourable to their maturity; the soil is deep and strong, and well adapted to the growth of heavy timber; and the registry which the present volume contains may hereafter be of use in ascertaining the rate of growth of our most important forest tree.

To Henry Blyth, Esq., a large gold medal has been given, being the premium offered for embanking land from the sea. This gentleman has gained a tract of two hundred and fifty-three acres of rich land in the parish of Burnham Deepdale, which, during ordinary spring-tides, was covered with water to the depth of four or five feet. The undertaking was successfully conducted under the superintendance of Mr. Telford, by erecting a bank a mile and a half long, of such solidity as to have resisted some very heavy gales of wind. Part of the land thus reclaimed has been broken up for tillage, part has been laid down to grass, and the remainder is preparing for cultivation, as fast as circumstances permit.

The sum of thirty guineas, being the premium offered, has been awarded to Messrs. Cowley and Staines of Winslow, for their continued successful cultivation of the white poppy, for the purpose of extracting opium from it.

This is the third premium, to the same amount, which has been given to these gentlemen for British opium. In the year 1821, from four acres of poppy, they obtained sixty pounds of opium; in the next year, from eleven acres, they obtained one hundred and forty-three pounds, and in the last year, from a little more than twelve acres, they obtained one hundred and ninety-six pounds.

The quality of their first produce was considered to be equal to Turkey opium; and is now, from its superior purity, in such estimation, that the last crop has sold readily at a price of two shillings per pound above the best foreign opium in the market.

The results of three successive years show that capital can be profitably engaged in this branch of cultivation, and it has the farther advantage of employing great numbers of women and children during the season of collecting the juice; the expense of this part of the process alone amounting to nine shillings and sixpence on every pound weight of opium obtained.

The thanks of the Society have been voted to Mr. Salisbury of Brompton, for his diligence in collecting facts tending to show that the *phormium tenax*, or New Zealand flax, may be successfully cultivated in the south-western counties of England, and in many parts of Ireland. As the plant is perennial and propagated by offsets, and as the flax or fibre is contained in the leaves, it seems peculiarly well adapted for the moist warm climate of Ireland. The Society therefore earnestly recommend a full and fair trial of it to the landholders of the sister kingdom.

In the Class of Chemistry---The large silver medal has been given to Mr. Dickinson of the Kent-road, for a self-acting machine, by means of which malt-liquors, while in a state of fermentation, are cleared with less trouble and smaller loss of liquor than usual. It is particularly adapted to breweries of rather small extent, and may be employed by those families who brew their own beer. Its mode of action is to supply the barrel with fresh liquor in proportion as the yeast is separated, so that it shall always be quite full.

A large silver medal has also been given to Mr. H. Wilkinson of Ludgate-hill, for his improved safety-chamber to the oxy-hydrogen blowpipe. Mr. Gurney was rewarded the year before last, for an apparatus which ensures the safety of the experimenter, when the orifice of the discharging pipe is very small. Mr. Wilkinson by filtering the gas through filamentous asbestos as well as through wire gauze (which latter was used by Mr. Gurney) has increased the safety so as to allow the use of a larger discharging pipe, and has proportionally increased the range and utility of the instrument.

Mr. T. Griffiths of Kensington, has been rewarded with the silver Vulcan medal for his improved stop-cock for chemical purposes. The stop-cocks at present in use for transferring gases from one vessel to another are made of brass. Several of the gases are corrosive, and act readily either on brass or copper, the result of which is, that stop-cocks soon become leaky or useless in consequence of the plug being set fast: it may also be added that the results of delicate analytical experiments may be vitiated by the chemical action of the gas under examination on the material of the tube through which it is transferred. Mr. Griffiths, by lining the tube with platina, and by coating with the same metal all the surfaces with which the gases come in contact, while passing through a stop-cock, has obviated most of the inconveniences complained of, without inordinately increasing the cost of the instrument.

The large silver medal has been voted to Mr. Chapman, of Whitby, for his mode of consuming the smoke generated in the fire-places of steam-engine boilers. The premium offered by the Society for the complete accomplishment of this very desirable object is the large gold medal or fifty guineas. The testimonials accompanying Mr. Chapman's communication are from eye-witnesses, and persons of known respectibility, and they all depose to his entire success. The scale, however, of Mr. Chapman's experiments (they being made only on a three horse power steam-engine) was not considered by the Society sufficiently large to entitle him to the full premium; it being well known that many methods are quite effectual when applied to small boilers, while with larger ones they fail of producing the anticipated results. The principal novelty in Mr. Chapman's practice is, that he makes the grate-bars in the form of hollow tubes, through which air flows in its passage to the back part of the fire-place, where, being already heated, it is brought in contact with the smoke, and occasions a considerably more complete combustion of it than would happen if it were mixed with cold air.

The Society have directed the publication of the results of some experiments made at their request, on the value of East Indian annatto as a dyeing drug for silk. The article was placed at their disposal by the manufacturers of it in Bengal, and it is hoped that the trials made on it, in comparison with the best Spanish annatto, will be found useful.

In the Class of Polite Arts, besides the premiums which have been distributed for personal proficiency in various branches of the art of design, the large gold medal has been voted to Mr. Edmund Turrell of Somers Town, an engraver of eminence, for his improved menstruum for biting-in on steel plate.

The menstruum usually employed for this purpose has been nitric acid, or acidulous nitrate of copper, but this and various other liquids which have been tried, although they succeed to a certain degree, are very far from producing that clearness and depth of line which the artist requires. A steel plate will give, at least, ten or twelve times more impressions than a copper plate will; but to the use of this material the want of a good menstruum was a very serious obstacle. Mr. Turrell, by supplying this deficiency, has rendered great service to his art: and, judging from the experiments performed by him in presence of the committee, as well as from the testimony, founded on experience, of his brother artists, the discovery promises to be of much importance.

Steel plate has not only been used as the material for etching on, but also has been employed with equally good effect, both as regards durability and excellence of execution, by the engravers in mezzotinto. In the session before last, a medal was given to Mr. Lupton, for one of the first mezzotintos on steel; and last year, Mr. Solly, one of the chairmen of the Committee of Polite Arts, employed Mr. Charles Turner to make an engraving on steel, from a portrait painted by Sir Joshua Reynolds. Twelve hundred impressions having been taken from this plate, were presented by Mr. Solly, with his accustomed liberality, to the Society, of which one

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will be delivered with the present volume to each member.

The silver Isis medal and ten guineas have been conferred on Mr. Straker, for his improved method of embossing on wood. It may be employed either by itself or in conjunction with carving, and is founded on the fact, that if any depression be made on the surface of wood, by means of any blunt tool, such depressed part will assume its original height by subsequent immersion in warm water. Any given pattern, therefore, being indented or impressed on a plate of fine grained wood, the ground is to be reduced by filing or planing to the same level as the depressed part; the wood being then soaked in warm water, the indented portions resume their original height, appearing in relief more or less high, according to the previous depression.

The thanks of the Society have been voted to Mr. Joseph Fincher, assistant secretary at the Royal Institution, for his ingenious, simple, and very effectual mode of preventing fraudulent erasures in bankers' checques, a crime by which many persons having large money transactions, have of late suffered severely.

The thanks of the Society have also been voted to Mr. Ferguson, Mr. Lea, and Mr. Palmer, for their respective communications on the best and most effectual means of preventing the forgery of bank notes. These plans are published in the present volume, and will also be inserted in the second edition, now preparing, of the Society's report on the same subject.

The Society, desirous of knowing and of making the public acquainted with the real quality of the fine wools of late years imported from the colony of New South Wales, instituted, in the Class of Manufactures, a premium of the gold Isis medal for this purpose. On a former occasion it was given to Mr. Starkey, and last year has been awarded to David Maclean, Esq. Mr. Starkey's cloth was manufactured in Yorkshire, Mr. Maclean's in Gloucestershire. The characteristic of the New South Wales' wool is extreme softness. The only disadvantage to which it appears liable, is a deficiency in the quality of felting, on which account it appears better fitted to improve the quality of the harsher Merino wools of Spain and Germany, than to be employed by itself in the manufacture of fine cloth.

For some years past the Society has been turning its attention to the manufacture of British straw-plat in imitation of Leghorn. A bonnet, made of one of the native grasses of the state of Connecticut in North America, was four years ago laid before the Society, which, in fineness of material, appeared to equal the best articles of Italian manufacture. In return for a medal and a pecuniary donation, the Society obtained a packet of seed of the grass, and a particular account of the bleaching and other processes employed in manufacturing it. This information was published, the seed was distributed, and an explanation of the mode of platting according to the Italian pattern, and of subsequently uniting or knitting the plat together, was inserted in the Transactions; the intention of the Society being to await the result of their attempt to naturalize the American grass. In the mean time Mr. Cobbett investigated the subject under a different point of view: considering it to be very probable that some of our own grasses were possessed of the requisite qualities, he collected samples of several species, bleached them to a good colour by a cheap, simple, and easy process, and, having had them platted according to the Italian pattern, presented them to the Society. A medal, most amply merited, was awarded two years ago to Mr. Cobbett for his exertions; and, at the republication of the annual premium-list, rewards were offered both to encourage the growth of the American grass, and to promote the manufacture of bonnets in imitation of Leghorn from our native grasses. Nearly twenty claims for the latter premium were, during the last session, sent in from various parts of the country; and the Society, desirous of giving all the encouragement which other demands on their funds would allow, granted pecuniary or honorary rewards to sixteen of the candidates. The specimens sent, due allowance being made for the imperfections attending first attempts, are greatly to the credit of the authors, and afford a reasonable prospect of recovering, in no great length of time, a branch of manufacture, which, for many years, has been a source of ease and competence to the labouring classes, in districts less favoured than many others by natural advantages.

The sum of five guineas has been voted to Mr. P. Caron of Spitalfields, for a method, superior to that generally practised, of preventing a waviness or play of light, not unfrequently observed in plain silks, technically called watering, which detracts considerably from their value, and appears to be owing to unequal pressure of the folds on each other, as the web or piece is rolled on the cylinder during the progress of weaving.

In the Class of Mechanics—The sum of ten guineas has been given to Mr. Watt, for a screw wrench, and the silver Vulcan medal to Mr. Eddy of Oxford-street, for a modification of the same instrument; and five guineas have been voted to Mr. Gladwell of Garden-street, Vauxhall, for an improved plane for the use of carpenters. Expedition on the part of the workman, and precision in his work, depend materially on the tools which he employs. Any improvement in these, therefore, deserves, and has always received, a due compensation from the Society. A modification calculated to save only half an hour in a day, is a gain of full four per cent. in the time or wages of all the workmen who enjoy the benefit of it, and when this is multiplied by the number of the men, and of working days in the year, an improvement, trivial, abstractedly considered, may be of more practical value than many an elaborate and ingenious invention.

The silver Vulcan medal and ten guineas have been voted to Mr. Welsh of Walworth, for his original screw. The manner in which this screw is formed is very ingenious, and dispenses with the use of a screw engine with its guide-screw, wheel-work, slide-rest, and other expensive fittings. With regard to the accuracy of the screw itself, it was found, when examined by the micrometer, to be erroneous only to the amount of one two hundred and fiftieth of an inch in thirty-four threads, and therefore deserves the character of a very good screw, though not sufficiently accurate for astronomical purposes.

The silver Vulcan medal and ten guineas have been voted to Mr. Duce of Wolverhampton, for his quadruple lock for safe chests, all the bolts of which are shot or withdrawn, in succession, by a single revolution of the same key.

The large silver medal has been voted to Edward Speer, Esq., for his concentric chuck for the use of turners, which facilitates the operation of chucking, saves materials, and diminishes the risk to novices in the art, of injury to themselves, or to the tools which they employ.

Captain Bagnold has been rewarded with the silver Vulcan medal for an improvement on the culinary steam boiler, consisting in a bent tube connected with the steam-vessel, and dipping into a small cistern of water, by which arrangement the steam that would otherwise escape in vapour, to the annoyance of the byestanders, is condensed, while the bubbling of the steam in the cistern affords a useful indication to the person who is employing the apparatus.

To Mr. Aitkin the sum of twenty guineas has been awarded, for his remontoire escapement.

Mr. Bothway of Devonport has received the silver Vulcan medal for a very convenient apparatus for invalids confined to bed, by means of which they may vary their posture from recumbent to sitting, or the contrary, without assistance, and be supported, while sitting, more firmly, and therefore more agreeably, than by the usual application of pillows or cushions.

The sum of twenty guineas has been voted to Mr. Stirling of Glasgow, for his working drawings of a steam-engine, which remain with the Society for the inspection and use of the members and the public.

The large silver medal and fifteen guineas have been granted to Mr. Franklin, for his improved mode of feeding high-pressure steam-boilers. The advantages of this contrivance are, that the elastic pressure on each side of the feeding valve is equalized, and the apparatus, by means of a stone float, is rendered self-acting.

T. Bewley, Esq. of Montrath, in Ireland, has had the large silver medal voted to him for communicating the particulars of an apparatus by means of which he supplies the stories of his cotton factory with fresh air, warmed by means of the heat produced in burning lime, a mode of economizing fuel, which, in favourable situations, may be turned to good account.

To Mr. F. Richman, the large silver medal has been voted for his ingenious manner of raising a sunken floor.

The large gold medal has been voted to Mr. Ainger for his method of supporting beams, the ends of which, resting on the wall plate, have become decayed from dry-rot or any other cause. The plan, which will be found fully detailed in Mr. Ainger's paper, has been successfully applied by the inventor to the roof of the church of St. Mary Aldermary in the City of London; and, by means of it, a very elaborate cieling, which had been reduced to a dangerous state by the failure of the ends of most of the beams by which it was supported, has been placed out of hazard without the smallest injury to the cieling itself.

The sum of ten guineas has been awarded to Richard Soper, recently invalided from the dock-yard at Devonport, for an improved ladle with a moveable lip, for paying the seams of ships, and for the useful addition of a strainer to the pitch boiler.

To Mr. W. P. Green, Lieutenant R. N., the large silver medal has been awarded for an improved mode of working ships' guns, whereby fewer men and less space than usual are required: it will therefore probably be found of use in the round sterns of the ships of war recently constructed by Sir. R. Seppings.

The sum of twenty guineas has been voted to Mr. Clint for an experiment, which, as far as it has been tried, has been found to be successful, of suspending the masts of cutter-rigged vessels by means of pivots in the deck, and of attaching to the lower end of the mast a cradle in which most of the ballast is placed. The mast thus swings on its pivots, and is retained in an upright position by the gravity of the attached ballast. When the wind blows strong the mast and rigging incline to leeward, while the vessel continues to go on an even keel. The supposed advantages of this plan are, the capability of employing with safety a greater spread of sail than usual, and drifting less to leeward. The idea of swinging masts is novel; the inventor has shown considerable ingenuity in adapting it to practice in a half-decked whale-boat; the trials made with it have hitherto been successful, and the Society have thought it worthy of encouragement, without, however, pledging themselves decidedly as to its real importance, which farther experiment, and on a larger scale, can alone ascertain.

The large silver medal has been voted to Captain Burton, R. N., for his mode of securing an anchor to to the bows of a ship, whereby the services of fewer men are required to disengage it previous to anchoring, and the hazard of serious accidents, from the ropes of the cat-head pullies getting entangled with the legs of the people, is avoided.

Mr. W. J. T. Hood, Lieutenant R.N., has had the gold Vulcan medal voted to him, for an improved mode of managing the screen glasses in the naval quadrant; whereby many opportunities of taking the altitude of the sun and moon for lunar observations, for apparent time and other purposes familiar to navigators, which are now lost in consequence of the variable state of the weather in these latitudes, may be taken advantage of; a circumstance of the utmost importance in entering the British channel, and the want of which will often put a ship into great jeopardy.

The gold Vulcan medal has been voted to Mr. Smart of Pedlar's Acre, Lambeth, for his improved mode of supporting the topmasts of ships, by which the topmast is relieved from any dependence on the fid; and, in consequence, may be cast off and lowered whenever required without any difficulty, and without previously having recourse to the hazardous measure of slackening the shrouds, an advantage that every practical seaman will be duly sensible of.

In the Class of Colonies and Trade—M. Chazal of the Isle of France has had the large gold medal voted to him, being the premium offered to encourage the growth of silk in that colony.

The sum of thirty guineas has been voted to Mr. T. Kent, of New South Wales, for the importation of some tons of extract of mimosa-bark, prepared by him in that colony, an article likely to come into considerable use as a tanning material. The native and imported supplies of oak-bark are by no means sufficient to answer the demand, in consequence of which many thousand South American hides are annually sent to the continent in a raw state, whereby the profit of converting them into leather is lost to the country.

The large gold medal has been voted to John Macarthur, Esq. of Sydney, New South Wales, and the large silver medal to Hannibal Macarthur, of the same colony, for importing into this country fine wool the produce of their own flocks. The fine quality of the Merino wool of New South Wales has been already mentioned, and is becoming the principal export of that rising colony. The exertions of Mr. J. Macarthur have most essentially contributed to the production of this valuable staple, and the Society have much pleasure in adding another gold medal to those formerly conferred on him for this object.

THE Society beg leave to call the attention of the members to the PAPER *on which the present volume is printed. It is made from pure flax by Messrs.* HOLDSWORTH *and* PHILLIPS *of* DARTMOUTH.

ERRATA ET CORRIGENDA

IN VOL. XLI.

Page 18, *line* 5 *from bottom*, *for* and on the four sides, *read* and on the sides adjacent to the extremities.

—— 50, — 24, *for* figs. 7 and 8, *read* figs. 7, 8, and 9.

—— 52, *after line* 3, *add* fig. 17 is a transverse section of part of the stand in fig. 16, showing the connexion between the mercury in the trough and the cup *o*.

—— 74, *line* 20, *after* brass neck, *insert i*.

—— 76, — 4, *for n*, *read m*.

—— 96, — *last*, *for* of it, *read* of their accomplishment.

——112, — 5, *for* the axis which gives, *read* the axles which give.

——112, — 14, *for* bobbin, *read* bobbins.

——113, — 10, *for b*, *read l*.

——114, — 6, *for* chisel, on the angles *z z*. Figs., *read* chisel on the angles. *z z* figs.

——123, — 16, *for* bottens, *read* battens.

——123, — 23, *after* the flap *h*, *add* fig. 5.

——135, — *last*, *for* ceas, *read* case.

——157, — 14 and 16, *for z*, *read* z.

——164, — 9, *after* spring, *add o* fig. 14.

——169, — 3 *from bottom*, *for* but, *read* and.

——174, — 2 *from bottom*, *after* iron plate, *add* the surface on which the bars are, being placed within.

——181, — 6, *for n*, *read m*.

——185, — 17, *after* messenger *add l*.

18, *after o*, *add* figs. 6 and 7.

22, *dele* by the others.

2 *from bottom*, *for* within about a fathom of the end, which is the side next the saw cuts, *read* within about a fathom from that end of the line which is attached to the head of the kite.

——186, — 19, *after* messenger, *add* figs. 2 and 3.

——227, --- 10. The following is a translation of the German quotation from Gesner:---"A small sea crab; a sea spider which inhabits the shells of dead sea snails or muscles.

——304, *for* an etching from Mr. Barry's Pandora, *read* a copper-plate etched by Mr. Schiavonetti from a drawing by Mr. Barry of Pandora attired by the Graces.

The proceedings of the subscribers to the fund for obviating the inconveniences arising from smelting copper ores, &c. was presented anonymously.

The description of Lieutenant-Colonel Pasley's Telegraph was presented by the author.

——307, --- 3 *from bottom*, *for* marine *read* saline.

In the Index, *for* Warren, J. *read* Warren, C.

PREMIUMS

OFFERED IN THE SESSION 1824-1825.

A LIST OF THE OFFICERS OF THE SOCIETY.

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HIS ROYAL HIGHNESS PRINCE AUGUSTUS FREDERICK
DUKE OF SUSSEX, K. G. &c. &c.

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Henry Coxwell, Esq.
George Deacon Midgley, Esq.

Colonies and Trade.

William Evans, Esq.
John Macarthur, Esq.

Miscellaneous Matters.

William Kirby, Esq.
Captain T. M. Bagnold.

Secretary, Arthur Aikin, Esq. *F.L.S.*
Assistant-Secretary, Mr. Thomas Woodfall.
Housekeeper, Miss A. B. Cockings.
Collector, Mr. Henry Harrison.

ADVERTISEMENT TO THE PUBLIC.

THE chief object of the Society is to promote the Arts, Manufactures, and Commerce of this Kingdom, by giving honorary or pecuniary Rewards, as may be best adapted to the case, for the communication to the Society, and through the Society to the public, of all such useful Inventions, Discoveries, and Improvements, (whether specified in these premiums or not), as tend to that purpose: in pursuance of this plan, the Society have already expended upwards of a *Hundred Thousand Pounds*, derived from voluntary subscriptions and legacies.

The meetings of the Society are held every Wednesday, at seven o'clock in the evening, from the first Wednesday in November to the second Wednesday in June. The committees meet on other evenings in the week during the session, for the purpose of taking into consideration the subjects referred to them by the Society. A person desirous of becoming a member of the Society, may be proposed according to the following form, which must be signed by three members of the Society, and delivered in to the secretary:

> A. B. [*Trade, profession, or designation of the candidate.*] proposed as a Member of the Society for the Encouragement of Arts, Manufactures, and Commerce, by
>
> C. D.
> E. F.
> [*Date.*] G. H.

Peers of the realm, or lords of parliament, are, on their being proposed, immediately balloted for: the names of other persons proposed to become members are read by the secretary to the Society, and are then inserted in lists which are hung up in the Society's room; they are balloted for at the second following ordinary meeting. In both cases, if two-thirds of the members then voting ballot in their favour, they are deemed perpetual members upon payment of not less than twenty guineas in one sum, or subscribing members upon payment of any sum not less than two guineas annually.

Ladies are eligible as members of the Society, and alone are entitled to vote by proxy at elections, through the medium of any gentleman who is a member, on his producing a written authority for the same.

Members are entitled to vote and assist in all the business of the Society and of the several committees. They have also the privilege of recommending two persons as visitors at the meetings of the Society; and, by addressing a note to the housekeeper, of introducing their friends on any week day, except Wednesday, between the hours of ten and two, to examine the various models, machines, and productions, in different branches of arts, manufactures, and commerce, for which rewards have been bestowed: also to inspect the magnificent series of moral and historical paintings, executed by the late J. Barry, Esq., which, with some valuable busts, statues, portraits, &c. decorate the public rooms of the Society.

Members have the use of the Society's library, which is valuable, and annually increasing by the purchase and donation of scientific and useful books, and of engravings. Contributions from members and others, in augmentation of the library, and of the collection of maps and prints, will be thankfully received, and duly acknowledged in the annual volume of the Society's Transactions, to a copy of which every member is entitled.

☞ To persons inclined to leave a sum of money to this Society by will, the following form is offered for that purpose:

> ITEM.—I give and bequeath to A. B. and C. D. the sum of upon condition, and to the intent that they, or one of them, do pay the same to the collector, for the time being, of a Society in London, who now call themselves *the Society for the Encouragement of Arts, Manufactures, and Commerce;* which said sum of I will and desire may be paid out of my personal estate, and applied towards carrying on the laudable designs of the Society.

The Society desire it to be clearly understood, that as a body they are not responsible for any opinion or representation of facts contained in their volumes. And the public are requested to guard against impositions from persons advertising as having patents for articles rewarded by the Society; they are also cautioned against purchasing articles sold under the pretended sanction of the Society's name.

The Society have lately published the 41st *volume* of their Transactions, which may be had by members, on application to the housekeeper. Complete *sets* of their *Transactions*, or any single volume, may be purchased at the Society's house; where may be had also,

An *Analytical Index of the first twenty-five volumes* of the Transactions to the termination of the session, June, 1807, price 1*s.*

Ditto, continued to the end of the 40th volume, price 1*s.*

A catalogue of books in the Society's library, 1*s.*

An engraving, by Schiavonetti, from Barry's picture of *Pandora;* price, on India paper, 15*s.*; and on French or English paper, 10*s.*; with an allowance of 25 per cent. to the trade or members.

A portrait engraved by Sharp, from a picture by West, of Mr. More, late Secretary of the Society; price 1*l.* 1*s.*; with allowance as above.

A description of Mr. Barry's paintings in the great room of the Society, *gratis.*

All communications are to be made by letter, addressed to *Arthur Aikin*, Esq. the secretary, at the Society of Arts, &c. Adelphi, London; and where articles are sent by sea, for the Society, the bills of lading are to be addressed to the care of *William Vaughan*, Esq. 70, Fenchurch-street, London, who has undertaken to receive them for the Society.

GENERAL NOTICE TO CANDIDATES.

The great object of the Society in rewarding individuals, is to draw forth and give currency to those inventions and improvements which are likely to benefit the public at large. Candidates are therefore requested to observe, that if the means by which the respective objects are effected require an expense or trouble too great for general purposes, the Society will not consider themselves bound to give the offered reward; but though they expressly reserve the power, in all cases, of giving such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the candidates may be assured the Society will always judge liberally of their several claims.

The Society by no means restrict their liberality to the subjects for which premiums are specially offered, but will take into consideration, and will reward by a bounty proportioned to its merit, any communication, the subject of which is of a practical nature, and calculated to promote the public good.

All communications are to be made by letter, addressed to the secretary; and are to contain full and particular details, according to the nature of the subject, as well as accurate descriptions of such drawings and models as form part of the communication: the models to be sent *carriage paid.*

In those cases in which certificates are required to be produced in claim of premiums, they should be expressed, as nearly as possible, in the words of the conditions attached to the respective premiums, and be signed by disinterested persons, who have a positive knowledge of the facts stated.

The premiums are designed for the United Kingdom, unless expressly mentioned to the contrary: but no claim will be attended to unless the previous conditions have been fully complied with.

No person shall receive any premium, bounty, or encouragement, from the Society, for any matter for which he has obtained any premium or reward from any other society, or for which he has obtained, or purposes to obtain a patent: it being a condition stipulated with every candidate, that all articles rewarded by the Society shall be freely given up to the public, to be made or manufactured by any person whatever.

All models, the production of which is attached as a condition to any premium, shall, upon the delivery of such premium, remain the property of the Society.

Where premiums or bounties are obtained in consequence of specimens produced, the Society will retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No member of this Society shall be a candidate for, or entitled to receive, any premium, bounty, or reward whatsoever, except the honorary medals of the Society.

No candidate, not a member, shall be present at any meeting of the Society or committees, or be admitted at the Society's rooms, after having delivered in his claims, until such claims are adjudged, unless summoned by the committee.

A candidate for a premium, or a person applying for a bounty, being detected in any attempt to impose on the Society, shall *forfeit* such premium or bounty, and be deemed incapable of obtaining any for the future.

The consideration of the claims for the premiums offered in the present list will take place during the session of the Society commencing on Wednesday the 3d of November, 1824. The several candidates and claimants, to whom the Society shall adjudge premiums or bounties, are to attend on the last Wednesday in May, to receive the same, that day being appointed by the Society for the distribution of their rewards; and before that time no premium or bounty will be delivered, except to those who are about to leave the kingdom.

In cases where the Society may think fit to admit excuses for not attending in person, deputies may be substituted to receive the rewards, provided such deputies are either members of the Society, or superior officers thereof.

PREMIUMS IN AGRICULTURE.

N. B.—*The Winchester bushel is the measure referred to for grain; and, as the acres of different districts vary in extent, it is necessary to observe, that the Society mean statute acres of five and a half yards to the rod or pole, and they request that all communications to them may be made agreeably thereto.*

I.—IMPROVEMENT OF LAND.

GAINING LAND FROM THE SEA.

1. To the person who shall have gained the greatest quantity of land from the sea, not less than one hundred acres, on the coast of Great Britain or Ireland;—the *Gold Medal.*

Certificates of the quantity of land, and that the experiments were begun after the 1st of January, 1819, to be produced to the Society on or before the first Tuesday in February, 1825.

IMPROVING WASTE LAND.

2. For an account of a method, superior to any hitherto practised, of improving land lying waste and uncultivated, verified by experiments on not less than fifty acres of land;—the *Gold Medal.*

3. For the next greatest quantity, not less than thirty acres;—the *Silver Medal.*

It is required that the land, before such improvement, be absolutely uncultivated, and in a great measure useless; and that, in its improved state, it be inclosed and cultivated.

Certificates of the number of acres, of the quality of the land so improved, with a full account of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced to the Society on or before the first Tuesday in February, 1825.

LAYING DOWN LIGHT LAND TO PERMANENT GRASS.

4. To the person who shall ascertain, by actual experiment, the comparative merit of the following modes of laying down light soils to permanent grass, with a view to obtain a good sward in the shortest time, viz. by inoculating or transplanting, as recently practised in the county of Norfolk, either with or without corn; by sowing grass-seeds in the spring, in the common way, with corn, buck-wheat, &c.; or by sowing grass-seeds alone in the autumn;—the *Gold Ceres Medal.*

It is required that every operation, and the expense of each mode, be fully described, with proper certificates of the soil and subsoil in each experiment being respectively of similar qualities, and of their having previously been similarly treated as to cultivation and manure, and of at least one acre having been tried under each system, to be produced to the Society on or before the last Tuesday in February, 1825.

MANURES.

5. For the most satisfactory set of experiments, to ascertain the comparative advantages of the following manures, used as top-dressings on grass and corn-land, viz. soot, coal-ashes, wood-ashes, lime, gypsum, bones, night-soil, or any other fit article;—the *Gold Medal.*

It is required that the above experiments be made between four of the above-mentioned manures, and that not less than two acres of land be dressed with each manure.

6. For similar comparative experiments on two or more kinds of manure;—the *Silver Medal.*

An account of the nature of the soil, the quantity and expense of the manure and crops, with certificates, to be produced on or before the last Tuesday in February, 1825.

II.—PLANTATIONS.

FOREST TREES.

7. To the person who shall have inclosed, and planted or set, the greatest number of acres (not less than one hundred) of land that is incapable of being ploughed, or otherwise unfit for tillage, with the best sorts of forest trees, namely, oak, Spanish chesnut, ash, elm, beech, alder, willow, larch, spruce or silver fir, (with or without screens of Scotch fir), adapted to the soil, and intended for timber trees, between the 1st of October, 1820, and the 1st of April, 1821;—the *Gold Medal.*

8. For the second greatest quantity of land, not less than fifty acres;—the *Silver Medal.*

A particular account of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper certificates that they were in a healthy and thriving state two years at least after making the plantations, to be delivered to the Society on or before the second Tuesday in February, 1825.

N. B. With the above forest trees, the seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

OAKS, NOT TRANSPLANTED.

9. For having set, in the season 1818-19, the greatest quantity of land, not less than twenty acres, with acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber;—the *Gold Medal.*

10. For the second greatest quantity of land, not less than ten acres, set agreeably to the above conditions;—the *Silver Medal.*

Certificates of setting agreeably to the above conditions, and that there are not fewer than three hundred young oaks, in good condition, on each acre, to be delivered to the Society on or before the first Tuesday in February, 1825.

LARCH.

11. For having planted out, between June, 1821, and June, 1822, the greatest number of larch trees, not fewer than fifty thousand, and for having effectually fenced and preserved the same, in order to raise timber;—the *Gold Medal.*

12. For the next greatest number, not fewer than thirty thousand;—the *Silver Medal.*

Certificates of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the first Tuesday in February, 1825.

N. B. The larch trees may be planted either mixed with other trees or by themselves, as may best suit the convenience of the planter.

NORWAY FIR.

13. To the person who shall have raised, in the year 1825, the greatest number of plants from seed of the Norway fir, imported from Norway;—the *Gold Medal.*

Certificates of the number of plants in a thriving state, not fewer than three thousand, to be produced to the Society, on or before the first Tuesday in February, 1827, accompanied by a full description of the methods followed in making the plantation, the expense of the same, the nature of the soil, and the district in Norway from which the seed was imported.

14. To the person who shall have imported from Norway the greatest number, not less than two thousand, of Norway fir seedlings, and shall have planted the same during the year 1822, placing them at sufficient distances from each other to stand for timber trees;—the *Gold Medal.*

Certificates of the number of plants, that they were in a thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the first Tuesday in February, 1825.

N. B. It is recommended to plant seedlings of about three or four years' growth, and in a moderately good soil, somewhat sheltered. The wood from the district of Christiania is esteemed the best for carpenters' and joiners' use; and for spars and ufers the trees near to Long Sound are most valued.

WALNUT TREES.

15. For having planted the greatest number of walnut trees, not less than two hundred, since June, 1822; and for having effectually fenced and preserved the same, in order to raise timber;—the *Gold Medal.*

16. For the next greatest number, not fewer than one hundred; —the *Silver Medal.*

Certificates of having planted agreeably to the above conditions, and that the plants were in a healthy and thriving state two years at least after making the plantation, and specifying the distance of the plants from each other, to be delivered to the Society on or before the first Tuesday in February, 1825.

SECURING PLANTATIONS.

17. To the person who shall give to the Society the most satisfactory account, founded on experience, of the most effectual and least expensive method, better than any other generally known, of securing young plantations of timber trees, and hedge-rows, from hares and rabbits, as well as from sheep and cattle, which, at the same time, shall be least subject to the depredations of wood-stealers;—the *Gold Ceres Medal,* or *Thirty Guineas.*

The accounts, and certificates of the efficacy of the method, to be produced to the Society on or before the first Tuesday in February, 1825.

III.—COMPARATIVE EXPERIMENTS ON RAISING TREES.

OAKS.

18. To the person who shall have ascertained in the best manner, by actual experiment, continued for five years at least, the comparative merits of the different modes of raising oaks for timber, from acorns set on land properly dug or tilled, from acorns set by the spade or dibble, without digging or tillage, either on a smooth surface, or among bushes, fern, or other cover; and from young plants previously raised in nurseries, and transplanted: regard being had to the expense, growth, and other respective advantages of the several methods;—the *Gold Medal.*

The accounts, and proper certificates that not less than one acre has been cultivated in each mode, to be produced to the Society on or before the first Tuesday in February, 1825.

WALNUTS.

19. To the person who shall communicate to the Society an improved mode of propagating the superior varieties of walnuts, either by budding, grafting, or any other mode, except sowing;—the *Gold Medal.*

Certificates that not fewer than fifty trees have been so raised; with a full account of the method practised, to be produced to the Society on or before the first Tuesday in April, 1825.

IV.—CULTIVATION OF CORN AND OTHER PLANTS.

WHEAT.

20. For the best set of experiments made on not less than twelve acres, four acres being sown broad-cast, four drilled, and four dibbled, in order fully to ascertain which is the most advantageous mode of cultivating wheat;—the *Gold Medal.*

It is required that every operation, and the expense of each mode of culture, be fully described; and that proper certificates of the nature and condition of the land on which the experiments were made, together with an account of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the first Tuesday in January, 1825.

GRASS SEEDS.

21. To the person who shall raise the greatest quantity of each or any of the following named grass-seeds, viz.:—Meadow Fox-tail (alopecurus pratensis), Sweet-scented Vernal-grass (anthoxanthum odoratum), Timothy-grass (phleum pratense), Meadow Fescue-grass (festuca pratensis), Smooth-stalked Meadow-grass (poa pratensis), Rough-stalked Meadow-grass (poa trivialis), Rough Cock's-foot (dactylis glomerata), Perennial Ray-grass (lolium perenne);—the *Silver Medal.*

It is required that certificates from persons who have viewed them in a proper state to identify that they are one or other of the seeds above mentioned, indicating clearly the particular species, and noticing the quantity produced of such seeds, free from weeds, or mixture of other grasses, together with proper samples of the seeds, be produced to the Society on or before the first day of February, 1825.

RYE GRASS.

22. To the person who shall produce to the Society a specimen of perennial rye-grass (lolium perenne), being from stock originally of his own selection, which shall possess the properties of coming to a sward in less time than the varieties hitherto cultivated; and which shall be permanent, more abundant, of better quality, and as early as the most forward of the varieties usually sown;—the *Silver Medal.*

It is required that five pounds of the seed, and a specimen of an entire plant of the grass, be forwarded with the communication.

Certificates of the candidate's having cultivated the variety produced not less than six years, of his having, at the time of making the communication, at least ten acres sown with it, and of its superiority over other varieties of the same species, to be produced to the Society on or before the last Tuesday in February, 1825.

SEED OF THE GRASS EMPLOYED IN MAKING FINE-PLAT.

23. To the person who shall, in the year 1824, collect the greatest quantity of seed, not less than one pound, from plants raised in Great Britain, of a species of Poa, a native of Connecticut in the United States, the stems of which are employed there as the material for fine plat, as described in the 40th volume of the Society's Transactions, and seeds of which have been imported and distributed by the Society;—the *Silver Medal,* or *Twenty Guineas.*

24. For the next greatest quantity, not less than half a pound;—the *Silver Ceres Medal,* or *Ten Guineas.*

Satisfactory certificates, with a sample of the seed, and of the grass from which it was produced, to be sent to the Society on or before the first Tuesday in February, 1825.

CULTIVATION OF GRASS FOR FINE-PLAT.

25. To the person who shall cultivate the greatest quantity of the above grass, not less than one acre, and shall send to the Society, on or before the last Tuesday in November, 1825, a particular account of the mode of cultivation, together with certificates of the state of the plantation;—the *Gold Ceres Medal.*

BEANS.

26. To the person who shall discover, and cultivate for two successive years, a species of horse-beans, or tick-beans, which, being sown in the spring, will ripen their seeds before the 21st of August;—the *Silver Medal.*

It is required that the experiment shall have been made each year on not less than five acres of land, that a particular account of the bean, the cultivation, and the expense attending it, with proper certificates of the nature and condition of the land on which the experiments were made, together with an account of the produce, the weight per Winchester bushel, and a sample of not less than a peck, be produced to the Society on or before the last Tuesday in February, 1825. It is apprehended that if a bean should be brought into cultivation with the habits of hotspur or other early peas, it would in a great measure escape the danger arising from the collier insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat.

PARSNIPS.

27. To the person who shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the particular purpose of feeding cattle or sheep;—the *Silver Medal.*

Certificates of the quantity of land so cultivated, with a particular account of the nature of the soil, and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the parsnips, and the advantages resulting from the practice, to be produced to the Society on or before the first Tuesday in February, 1825.

PREVENTING THE ROTTING OF CLOVER PLANTS.

28. To the person who shall communicate to the Society a satisfactory account of some method successfully employed in preventing the failure of clover crops, in consequence of the plants rotting on the ground, in the winter and spring, which they commonly do in patches, appearing to extend from a centre;—the *Gold Ceres Medal.*

Full particulars, and satisfactory certificates, to be produced to the Society on or before the second Tuesday in March, 1825.

The Society invite persons to communicate any information on this subject which may tend to discover the cause of the clover plant rotting, although they may not be able to point out an effectual mode of preventing the same.

HEMP.

29. To the person who, in the year 1824, shall have sown with hemp, either broad-cast or in drills at least 18 inches asunder, the greatest quantity of land, not less than fifty acres, and at the proper season shall have caused to be plucked the summer hemp (or male hemp bearing no seed), and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe;—the *Gold Medal.*

30. For the next greatest quantity, not less than twenty-five acres;—the *Silver Medal.*

Certificates of the number of acres, of the distance of the drills, of the plucking of the hemp, with a general account of the soil, cultivation and produce, to be delivered to the Society, along with fourteen pounds of the hemp and two quarts of the seed, on or before the last Tuesday in February, 1825.

CULTIVATION OF THE WHITE POPPY (PAPAVER SOMNIFERUM), AND EXTRACTION OF THE OPIUM.

31. To the person who shall prepare the greatest quantity of opium, not less than 250 lbs., from the white poppy (papaver somniferum), raised by the claimant, in Great Britain or Ireland, in the year 1824; —the *Gold Medal.*

32. To the person who shall obtain the next greatest quantity, not less than 120 lbs., raised by the claimant as above, he not having previously obtained the Society's premium;—the *Gold Ceres Medal*, or *Thirty Guineas.*

Certificates of the quantity and quality of the produce, with specimens, and a full description of the mode of culture, and of the extraction and preparation of the opium, to be sent to the Society on or before the first Tuesday in February, 1825.

Persons proposing to claim the above premium, are referred to Mr. Young's communications on the subject, in the 37th and 38th volumes of the Society's Transactions; to those by Messrs. Cowley and Staines, in the 40th and 41st volumes; and to one by Mr. Jeston, in the 41st volume.

CULTIVATION OF THE PHORMIUM TENAX, OR NEW ZEALAND FLAX.

33. To the person who, in any part of Great Britain or Ireland, shall plant the greatest quantity of land, not less than one acre, with the phormium tenax, or New Zealand flax;—the *Gold Ceres Medal*, or *Thirty Guineas.*

A full account of the soil and exposure, the mode of cultivation, the distance between the plants, at least a dozen of the longest leaves, with certificates that the plants have stood three winters in the open air, to be produced to the Society on or before the first Tuesday in March, 1826.

This premium is continued one year further, on the same conditions.

The plant is perennial, is propagated by off-sets, and the flax is prepared from the fibres of the leaves. It has been cultivated as an ornamental plant in the open air, for several years, in the vicinity of Dublin, and in various parts of the south of Ireland; also in South Wales, and in Devonshire. For a farther account of it, see Mr. Salisbury's communication in the 42d volume of the Society's Transactions.

PRESERVING CABBAGES.

34. To the person who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for supporting and fattening sheep and neat cattle during the months of February, March, and April;—the *Silver Medal.*

A full and accurate account of the method employed, and of the expense, together with certificates that the produce of four acres has been so preserved, and applied to feeding sheep or cattle, to be produced to the Society on or before the last Tuesday in April, 1825.

HARVESTING CORN IN WET SEASONS.

35. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet seasons;—the *Gold Medal.*

A full account of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and certificates that, at the least, the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples, to be produced to the Society on or before the first Tuesday in February, 1825.

VI.—DESTROYING INSECTS AND OTHER VERMIN.

DESTROYING THE GRUB OF THE COCK-CHAFER, &c.

36. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying the grub of the cockchafer, the wire-worm, or the slug, or of preventing or checking their destructive ravages on corn, peas, beans, and turnips;—the *Gold Medal.*

The accounts, with proper certificates, to be produced on or before the first Tuesday in February, 1825.

DESTROYING THE FLY ON HOPS.

37. To the person who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known;—the *Gold Medal.*

Accounts and certificates of the method having been successfully practised on not less than four acres of hop-ground, to be delivered to the Society on or before the first Tuesday in February, 1825.

DESTROYNIG THE FLY ON TURNIPS.

38. To the person who shall discover to the Society an easy and efficacious method of destroying the fly on turnips, or of preventing its injurious effect on the crop;—the *Gold Medal.*

Conditions the same as for the preceding premium.

PREVENTING THE BLIGHT ON FRUIT TREES AND CULINARY PLANTS.

39. To the person who shall discover to the Society the most effectual method of preventing the blight, and ravages of insects, on fruit trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments;—the *Gold Medal.*

The accounts, with proper certificates, to be delivered to the Society on or before the first Tuesday in February, 1825.

VII.—CATTLE AND SHEEP.

FEEDING CATTLE.

40. To the person who shall have made the best experiments on feeding cattle, to be continued for the space of twelve months, in order to prove the earliest maturity and greatest propensity to fatten, of the most approved breeds of cattle in Great Britain or Ireland, the experiments to be made on three different breeds, and on two head of cattle of each breed;—the *Gold Medal.*

A full account of the methods employed, the ages of the animals, the kind and quality of the food, the weights of them at the commencement and termination of the experiment, the expense attending the same, and such other observations as may be deemed important, together with certificates, to be produced to the Society on or before the first Tuesday in February, 1825.

41. To the person who shall have made the best experiments on the comparative value of mangel-wurzel and Swedish turnips for fatting cattle, ascertained by feeding not less than three head of cattle upon each kind of food;—the *Gold Ceres Medal.*

A particular account is required of the quality of the soil and subsoil, exposure, and mode of culture, produce per acre, and weight per diem of each kind of root consumed; also whether any, and what, other kind of food is given.

The communication, with certificates as to the condition of the cattle at the commencement and termination of the experiment, to be produced to the Society on or before the last Tuesday in February, 1825.

MILCH COWS.

42. To the person who shall have made the most satisfactory experiments on the comparative value of mangel-wurzel and Swedish turnips for feeding milch cows, ascertained by keeping not less than three cows on each kind of food;—the *Gold Ceres Medal.*

A particular account of the quality of the soil and subsoil, expense and mode of culture, produce per acre, and weight per diem of each kind of root consumed, also whether any, and what, other kind of food has been given, accompanied by certificates of the quantity and quality of the milk obtained, of the proportion of cream from a given quantity of the milk, and of butter from a given quantity of the cream, to be produced to the Society on or before the first Tuesday in March, 1825.

PROTECTING SHEEP.

43. To the person who shall practise and communicate to the Society the best and cheapest method of protecting large flocks of sheep, not less than five hundred, from the inclemency of the weather during the winter months, particularly in mountainous districts, where the practice of protecting sheep has not hitherto been adopted;—the *Gold Medal.*

A particular account of the experiments made, with the advantages arising therefrom, together with the expense, and certificates of its utility, to be produced to the Society on or before the first Tuesday in March, 1825.

N. B. It is required that the certificates shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time, together with the general method of managing them.

CACHEMIRE-SHAWL GOAT.

44. To the person who shall have kept in a healthy state, in any part of the United Kingdom, during the last three years preceding the first of February, 1825, the greatest number of Cachemire-shawl goats;—the *Gold Medal.*

Certificates that at least five goats are in good health at the time of making the communication, together with full particulars of the method of treating them, to be produced to the Society on or before the first of March, 1825.

The same premium is extended to the year 1826.

CURE OF THE ROT IN SHEEP.

45. To the person who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments;—the *Gold Medal,* or *Fifty Guineas.*

It is expected that the candidates furnish accurate accounts of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper certificates, must be delivered to the Society on or before the last Tuesday in February, 1825.

PREVENTING THE ILL EFFECTS OF FLIES ON SHEEP.

46. To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies;—the *Silver Medal,* or *Ten Guineas.*

It is required that the method be ascertained by repeated experiments, and that a certificate of its efficacy be delivered to the Society on or before the first Tuesday in February, 1825.

IX.—AGRICULTURAL MACHINES.

IRRIGATION OF LAND.

47. To the person who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for the purpose of irrigating land, superior to and cheaper than any other method now in use;—the *Gold Medal,* or *Fifty Guineas.*

A model, on a scale of one inch to a foot, with certificates that a machine at large, on the same construction, has been used, specifying the quantity of water delivered in gallons per hour, and the height to which it is raised, to be produced to the Society on or before the 1st of March, 1825.

PARING PLOUGH.

48. To the person who shall invent and produce to the Society a machine or plough, for the purpose of paring land preparatory to burning, superior to any hitherto known or in use for such purpose;—the *Silver Medal*, or *Twenty Guineas.*

The machine, and certificates that at least ten acres have been pared by it in a proper manner, to be produced to the Society on or before the 1st of February, 1825.

THRASHING MACHINE.

49. To the person who shall invent a machine by which corn of all sorts may be thrashed more expeditiously, effectually, and at less expense than by any method now in use, and without injuring the straw more than thrashing by the flail;—the *Gold Medal.*

The machine, or a model, with proper certificates that such a machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1825.

PREMIUMS IN CHEMISTRY, DYEING, AND MINERALOGY.

INCREASING STEAM.

50. To the person who shall invent and discover to the Society a method, verified by actual experiment, of increasing the quantity or force of steam in steam engines, with less fuel than has hitherto been employed, provided that in general the risk of accidents be not increased, and the whole amount of the expenses in using steam engines be considerably lessened;—the *Gold Medal*, or *Fifty Guineas.*

To be communicated to the Society on or before the last Tuesday in February, 1825.

PREVENTION OF SMOKE.

51. To the person who shall invent and produce to the Society the best and easiest means, superior to any now before the public, of preventing the emission of dense smoke, from the chimnies of steam-engines, breweries, and manufactories;—the *Gold Medal*, or *Fifty Guineas.*

Certificates that the means proposed have been found to succeed in practice, to be produced to the Society on or before the first Tuesday in February, 1825.

TEST FOR ARSENIC.

52. To the person who shall discover to the Society a test for arsenic in solution, superior to any hitherto known;—the *Gold Medal.*

It is required, that any communication in claim of this premium shall include a method of detecting arsenic, not only in its usual form of white arsenic, or arsenious acid, but also in the state of arsenic acid, and of the soluble salts formed by the combination of arsenious and arsenic acids with alkaline substances.

Claims for this premium to be delivered in on or before the first Tuesday in February, 1825.

PREVENTING THE ILL EFFECTS OF SMELTING ORES.

53. To the person who shall invent and discover to the Society the most effectual method of preventing the ill effects arising to vegeta-

tion and animal life, from the sulphureous, arsenical, or other noxious fumes disengaged in smelting the ores of copper, zinc, lead, tin, iron, &c. in the large way; and, if possible, of converting those pernicious fumes to useful purposes, in a manner superior to any hitherto known or in use;—the *Gold Medal*, or *Fifty Guineas.*

It is required that a full account of the process employed, with certificates of its being successfully carried into effect, to be produced to the Society on or before the first Tuesday in February, 1825.

FINE BAR-IRON.

54. To the person who shall make the greatest quantity of bar-iron, not less than ten tons, with coke, from coke pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for being converted into steel;—the *Gold Medal*, or *Fifty Guineas.*

Samples, not less than one quarter of a hundred weight, with certificates that the whole quantity is of equal quality, to be produced to the Society on or before the first Tuesday in February, 1825.

REFINING COPPER FROM THE ORE.

55. To the person who shall discover to the Society a method of separating, purifying, and refining copper from the ore, so as to render it fit for those purposes to which fine copper is now applied, and by a process cheaper than, and superior to, any hitherto known or in use;—the *Gold Medal*, or *Fifty Guineas.*

Certificates that not less than three tons have been so prepared or refined, and a quantity not less than 14 lbs. of the copper so refined, to be produced to the Society on or before the first Tuesday in February, 1825.

REFINING ZINC FROM THE ORE.

56. To the person who shall invent and communicate to the Society a process of refining zinc from the ore, superior to any hitherto known or in use, and fit for the purpose of making fine brass;—the *Gold Medal*, or *Fifty Guineas.*

Conditions the same as in the preceding premium.

PREPARING BRASS.

57. To the person who shall discover a method of making brass from materials the produce of Great Britain or Ireland, of superior quality to that commonly manufactured in this country, and equal to foreign brass;—the *Gold Vulcan Medal*, or *Thirty Guineas.*

A full account of the process, and of the ingredients employed, together with their proportions, and certificates that one ton has been so manufactured, and a sample of the brass, not less than 14 lbs., to be produced to the Society on or before the first Tuesday in February, 1825.

IMPROVED EARTHENWARE CRUCIBLES.

58. To the person who shall invent and discover to the Society a process for manufacturing earthenware crucibles which shall not be liable to crack in the fire, and shall be capable of enduring higher degrees of heat than those now in use, and shall not be too expensive;—the *Gold Vulcan Medal*, or *Thirty Guineas.*

A full account of the process, and of the materials employed, with satisfactory certificates of the crucibles having been found to answer in use, and specimens of the crucibles, with covers of the same material, to be produced to the Society on or before the first Tuesday in February, 1825.

PURIFICATION OF COAL GAS.

59. To the person who shall discover the cheapest method of purifying the inflammable gas procured from coal, superior to any method now in use;—the *Gold Vulcan Medal*, or *Thirty Guineas.*

A full account of the process, with certificates of its fully answering the intended purpose, to be produced to the Society on or before the second Tuesday in Feb. 1825.

REFINING WHALE OR SEAL OIL.

60. To the person who shall invent and discover to the Society an effectual method of purifying whale or seal oil from the glutinous matter that incrusts the wicks of lamps, and extinguishes the light, though fully supplied with oil; provided that such purified oil resists congelation in an equal degree with the unpurified;—the *Gold Medal*, or *Fifty Guineas.*

It is required that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society, to determine the validity of the claim; and certificates that not less than twenty gallons have been purified according to the process delivered in, together with two gallons of the oil in its unpurified state, and two gallons so refined, to be produced to the Society on or before the second Tuesday in February, 1825.

OIL FOR CHRONOMETERS.

61. To the person who shall invent and discover to the Society a method, verified by actual experiment, of rendering oil more fit than any now in use for chronometers and watches, particularly in being less liable to become thick or rancid;—the *Gold Medal,* or *Fifty Guineas.*

A full account of the experiments, and of the process or processes employed, verified by satisfactory certificates, together with a specimen of the oil, to be produced to the Society on or before the last Tuesday in March, 1825.

CROWN GLASS.

62. To the person who shall make crown or window glass equally transparent, and as free from blue and green colour, as the best German sheet;—the *Gold Vulcan Medal,* or *Thirty Guineas.*

Certificates that not less than two cwt. have been made, together with one whole plate and two of the largest squares that can be cut, and a full account of the proportions of the ingredients, and of the process of manufacture, to be produced to the Society on or before the last Tuesday in February, 1825.

FLINT GLASS.

63. To the person who shall make flint glass free from veins, as dense and transparent as the best now in use, and quite fit for the purposes of opticians;—the *Gold Medal,* or *Thirty Guineas.*

A full account of the process, with certificates that not less than 20 lbs. have been made, and that object glasses, at least three and a half inches in diameter, have been manufactured of the same, together with specimens of the glass in its rough and manufactured state, to be produced to the Society on or before the last Tuesday in January, 1825.

INDELIBLE INK.

64. To the person who shall discover to the Society a method of making a black ink proper for writing, superior to any at present known, indestructible by chemical applications, and not too dear for common use;—the *Silver Medal,* or *Fifteen Guineas.*

Certificates that not less than two gallons of such ink have been actually prepared, and found to possess the qualities above-mentioned, with a full detail of the process of making it, and two quarts of the ink, to be delivered to the Society on or before the second Tuesday in February, 1825.

PRINTERS' INK.

65. To the person who shall invent and discover to the Society the best composition for printers' ink, superior to any hitherto known or in use;—the *Gold Medal,* or *Thirty Guineas.*

Certificates that 112 lbs. of such ink have been made, with a full account of the process employed, and 6 lbs. of the ink, to be produced to the Society on or before the first Tuesday in February, 1825.

COPPER-PLATE PRINTERS' INK.

66. To the person who shall invent and discover to the Society the best composition for printers' ink, superior to any hitherto known or in use, and fit for the finest kind of copper-plate printing;—the *Gold Medal*, or *Thirty Guineas*.

Certificates and conditions the same as for the last premium.

RENDERING LEATHER WATER-PROOF.

67. To the person who shall discover a method, superior to any now in use, and of moderate price, of rendering leather water-proof, without injuring its texture or pliability;—the *Silver Medal*, or *Fifteen Guineas*.

A full account of the process, and of the ingredients employed, together with their proportions, attested by satisfactory certificates, as well as samples of the leather in its unprepared and prepared state, to be produced to the Society on or before the first Tuesday in February, 1825.

PRESERVING SEEDS OF VEGETABLES.

68. For the best method of preserving seeds of plants, during a long sea voyage, in a state fit for vegetation, a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the last Tuesday in February, 1825;—the *Gold Medal*, or *Thirty Guineas*.

PRESERVING PROVISIONS FROM BECOMING RANCID OR RUSTY.

69. To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from becoming rancid or rusty;—the *Gold Medal*, or *Thirty Guineas*.

A full description of the method, with proper certificates that it has been found, on repeated trials, to answer the purpose intended, to be produced to the Society on or before the last Tuesday in February, 1825.

PRESERVING IRON FROM RUST.

70. To the person who shall invent and discover to the Society a cheap composition, superior to any now in use, which shall effectually preserve wrought iron from rust;—the *Gold Medal*, or *Fifty Guineas*.

A full description of the method of preparing the composition, with certificates that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with one pound weight of the composition, on or before the last Tuesday in January, 1825.

PREVENTING THE DRY-ROT IN TIMBER.

71. To the person who shall discover to the Society a certain method of preventing the dry-rot in timber, superior to any hitherto known;—the *Gold Medal*, or *Fifty Guineas*.

The particulars of the method of prevention, confirmed by repeated experiments, to be produced to the Society on or before the last Tuesday in February, 1825.

PREVENTING THE MILDEW IN PAPER.

72. To the person who shall communicate to the Society a process to be used in the manufacture of paper, or some application to be made to manufactured paper, which shall effectually prevent it from becoming mildewed;—the *Gold Medal*, or *Thirty Guineas*.

A full account of the process employed, with certificates and other evidence of its efficacy, to be communicated to the Society on or before the last Tuesday in February, 1825.

PREVENTING THE DESTRUCTIVE EFFECTS FROM MOTHS.

73. To the person who shall discover to the Society a cheap, easy,

and effectual method, verified by repeated and satisfactory trials, of preventing the destructive effects occasioned by moths and other insects, in furs, woollens, and other articles, superior to any hitherto known or practised;—the *Gold Medal*, or *Thirty Guineas.*

The accounts, with proper certificates, to be produced to the Society on or before the first Tuesday in January, 1825.

SUBSTITUTE FOR LEAD PIPES.

74. To the person who shall invent and produce to the Society a substitute for the lead pipes used for conveying malt and other liquors from the cellars to the bars of public-houses, superior to any other metal pipes now in use;—the *Gold Medal*, or *Fifty Guineas.*

The substance of which the pipe is made must be free from any poisonous or noxious quality, equally durable as lead, and of a moderate expense; and a specimen thereof, not less than ten yards in length, with a complete description of the process employed in forming it, must be produced to the Society on or before the last Tuesday in February, 1825.

SUBSTITUTE FOR THE BASIS OF WHITE PAINT FOR OIL COLOURS.

75. To the person who shall produce to the Society the best substitute, superior to any hitherto known, for the basis of white paint for oil colours, equally proper for the purpose as the white lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white lead;—the *Gold Medal*, or *Fifty Guineas.*

A quantity of the substitute, not less than 10 lbs. weight, with an account of the process used in preparing it, and certificates that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in February, 1825.

SUBSTITUTE FOR TAR.

76. To the person who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind, and prepared from materials the produce of the United Kingdom, or its colonies;—the *Gold Medal*, or *One Hundred Guineas,*

A quantity of the substitute, not less than 25lbs., with certificates that at least one ton has been manufactured, and that it can be afforded at a price not exceeding that of the best foreign tar, together with an account of the process, to be delivered to the Society on or before the first Tuesday in February, 1825.

DYEING SILK OF A PINK OR ROSE COLOUR.

77. To the person who shall invent and discover to the Society a process of dyeing rose and pink colours in silks, without the use of safflower, by a substitute of British or colonial growth, which shall produce a colour equally beautiful and permanent, and at an expense not more than two-thirds of the current price;—the *Gold Medal*, or *Forty Guineas.*

The communication, with a full account of the processes employed, and certificates that the required conditions are accomplished, to be produced to the Society on or before the first Tuesday in February, 1825.

IMPROVED BLACK DYE FOR SILK OR WOOL.

78. To the person who shall invent and discover to the Society a black dye for silk or wool, superior in colour and durability to any at present in use;—the *Gold Medal*, or *Fifty Guineas.*

This premium is more immediately intended for the improvement of those colours known by the name of blue blacks.

A full account of the process and ingredients employed, together with their proportions, attested by satisfactory certificates, as well as samples of the silk or wool so dyed, to be produced to the Society on or before the first Tuesday in February, 1825.

DYEING WITH LAC LAKE, OR WITH THE COLOURING MATTER OF LAC.

79. To the person who shall invent and discover to the Society a process for dyeing silk, wool, or cotton with lac lake, or with the colouring matter of lac, superior to any now in use;—the *Gold Medal*, or *Thirty Guineas*.

A full account of the process, with certificates that it has been found to answer completely in use, and specimens of articles so dyed, to be produced to the Society on or before the first Tuesday in February, 1825.

PREPARATION OF A RED STAIN FOR COTTON CLOTH.

80. To the person who shall communicate to the Society the most effectual method of printing or staining cotton cloth with a red colour, by an immediate application of the colouring matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder;—the *Gold Medal*, or *Fifty Guineas*.

Certificates that the process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length; one piece of the calico so printed, one pound of the colour, and a full account of the preparation and application thereof, to be produced to the Society on or before the second Tuesday in February, 1825.

PREPARATION OF A GREEN COLOUR FOR PRINTING COTTON CLOTH.

81. To the person who shall communicate to the Society the best method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld, and the solutions of indigo;—the *Gold Medal*, or *Fifty Guineas*.

Certificates and conditions as for premium 80.

PERMANENT WHITE PAINT FOR THE USE OF ARTISTS.

82. To the person who shall produce to the Society a white paint for oil, superior to any hitherto known, and not liable to be discoloured by exposure to light or to sulphuretted hydrogen gas;—the *Gold Medal*, or *Thirty Guineas*.

A full account of the process, and 1 lb. of the colour, to be produced to the Society, on or before the second Tuesday in February, 1825.

RED PIGMENT.

83. To the person who shall discover to the Society a full and satisfactory process for preparing a red pigment, fit for use in oil or water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable;—the *Gold Medal*, or *Fifty Guineas*.

One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1825.

N. B. It is required, that the colour should remain unaltered by common exposure to strong light, damps, and noxious vapours.

BLUE PIGMENT.

84. To the person who shall prepare a blue pigment, equal in colour, brilliancy, and durability, to the best ultramarine prepared from lapis lazuli, and which may be afforded at a cheaper rate;—the *Gold Medal*, or *Thirty Guineas*.

The conditions are the same as in the preceding premium for the red pigment.

COLOURLESS LAC VARNISH.

85. To the person who shall produce to the Society a varnish made from shell or seed lac, equally hard and as fit for use in the

arts as that at present prepared from the above substances, but deprived of its colouring matter;—the *Gold Medal*, or *Thirty Guineas.*

A full account of the process, and one quart of the varnish, to be produced to the Society on or before the second Tuesday in January, 1825.

STONE FOR LITHOGRAPHY.

86. To the person who shall discover within Great Britain or Ireland, a quarry of stone fit for the purposes of lithography, equal at least to the stones imported from abroad;—the *Gold Medal*, or *Fifty Guineas.*

A specimen of the stone, at least two feet square and two inches in thickness, with an account of the situation of the quarry, and certificates of its possessing considerable extent, to be produced to the Society on or before the last Tuesday in February, 1825.

87. To the person who shall discover and communicate to the Society any substance equally fit for the purposes of lithography with the best stones imported from abroad;—the *Gold Isis Medal*, or *Thirty Guineas.*

A full description of the process of preparing or composing the substance, with specimens thereof, to be produced to the Society on or before the first Tuesday in February, 1825.

MINERALOGICAL AND GEOLOGICAL COUNTY MAPS.

88. To the person who shall complete and publish the best mineralogical and geological map of any county in the United Kingdom, on a scale of not less than one inch to a mile, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced, with sections of the strata;—the *Gold Medal*, or *Fifty Guineas.*

The map, with certificates of its accuracy, to be produced to the Society on or before the first Tuesday in February, 1825. One impression of the map to remain the property of the Society.

MINERALOGICAL AND GEOLOGICAL MAP OF IRELAND.

89. To the person who shall complete and publish an accurate mineralogical and geological map of Ireland, on a scale of not less than five miles to an inch, containing particulars described in the foregoing premium;—the *Gold Medal*, or *Fifty Guineas.*

The conditions are the same as in the preceding.

MINERALOGICAL AND GEOLOGICAL MAP OF SCOTLAND.

90. The same premium is offered for a mineralogical and geological map of Scotland, on similar conditions.

PREMIUMS IN POLITE ARTS.

HONORARY PREMIUMS FOR NOBILITY.

To Gentlemen under the age of twenty-five, Sons or Grandsons of Peers or of Peeresses in their own right of the United Kingdom.

91. For the best original painting or drawing of an historical subject;—the *Gold Medal.* For the next in merit, the *Gold Isis Medal.*

92. For the best copy of an historical subject;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

93. For the best original painting or drawing of a portrait;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

94. For the best copy of a portrait;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

95. For the best original painting or drawing of a landscape;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

96. For the best copy of a landscape;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

97. For the best original painting of flowers or fruit;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

98. For the best copy of fruit or flowers;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

99. For the best original painting of still-life;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

100. For the best copy of still-life;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

To Ladies under the age of twenty-five, Daughters or Granddaughters of Peers or of Peeresses in their own right of the United Kingdom.

101. For the best original painting or drawing of an historical subject;—the *Gold Medal.* For the next in merit, the *Gold Isis Medal.*

102. For the best copy of an historical subject;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

103. For the best original painting or drawing of a portrait;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

104. For the best copy of a portrait;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

105. For the best original painting or drawing of a landscape;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

106. For the best copy of a landscape;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

107. For the best original painting of flowers or fruit;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

108. For the best copy of flowers or fruit;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

109. For the best original painting of still-life;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

110. For the best copy of still-life;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

HONORARY PREMIUMS FOR GENTLEMEN AND LADIES.

To Gentlemen under the age of eighteen.

111. For the best drawing in chalk, pencil, or Indian ink, being a copy from any picture, print, or drawing of a head or figure;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

112. For the best drawing in pencil, Indian ink, or chalk, of a landscape, being a copy;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

To Gentlemen under the age of twenty.

113. For the best drawing in chalk, pencil, or Indian ink, from a bust;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

To GENTLEMEN *under the age of twenty-one.*

DRAWINGS AND PAINTINGS IN WATER-COLOURS.

114. For the best drawing in chalk, pencil, or Indian ink, from a statue or cast in plaster, of an entire figure;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

115. For the best drawing in pencil, Indian ink, or chalk of an historical subject, being a copy;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

116. For the best painting in water-colours, of an historical subject, being a copy;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

117. For the best painting in water-colours of a portrait, being a copy;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

118. For the best painting in water-colours of a landscape, being a copy;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

119. For the best painting in water-colours of flowers or fruit, being a copy;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

PAINTINGS IN OIL.

120. For the best copy in oil-colours of an historical subject;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

121. For the best copy in oil-colours of a portrait;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

122. For the best copy in oil-colours of a landscape;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

123. For the best copy in oil-colours of flowers or fruit;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

To GENTLEMEN *under the age of twenty-five.*

DRAWINGS AND PAINTINGS IN WATER-COLOURS.

124. For the best original painting in water-colours of an historical subject;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

125. For the best original painting in water-colours of a portrait, being a miniature;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

126. For the best original painting in water-colours of a landscape;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

127. For the best original painting in water-colours of flowers or fruit;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

PAINTINGS IN OIL.

128. For the best original painting in oil-colours of an historical subject, consisting of not less than three figures;—the *Gold Medal.* For the next in merit, the *Gold Isis Medal.*

129. For the best original painting in oil-colours of a portrait;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

130. For the best original painting in oil-colours of a landscape;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

131. For the best original painting in oil-colours of flowers or fruit;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

132. For the best original painting in oil-colours of still-life;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

To Ladies *under the age of eighteen.*

133. For the best drawing in pencil, Indian ink, or chalk, being a copy from any picture, print, or drawing, of a head or figure;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

134. For the best drawing in pencil, Indian ink, or chalk, of a landscape, being a copy;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

To Ladies *under the age of twenty.*

135. For the best drawing in pencil, Indian ink, or chalk, from a bust;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

To Ladies *under the age of twenty-one.*

DRAWINGS AND PAINTINGS IN WATER-COLOURS.

136. For the best drawing in pencil, Indian ink, or chalk, from a statue or cast in plaster, of an entire figure;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

137. For the best drawing in pencil, Indian ink, or chalk, being a copy, of an historical subject;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

138. For the best painting in water-colours, being a copy, of an historical subject;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

139. For the best painting in water-colours of a portrait, being a copy;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

140. For the best painting in water-colours of a landscape, being a copy;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

141. For the best painting in water-colours, being a copy, of fruit or flowers;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

PAINTINGS IN OIL.

142. For the best copy in oil-colours, of an historical subject;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

143. For the best copy in oil-colours of a portrait;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

144. For the best copy in oil-colours of a landscape;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

145. For the best copy in oil-colours of fruit or flowers;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

To Ladies *under the age of twenty-five.*

DRAWINGS AND PAINTINGS IN WATER-COLOURS.

146. For the best original painting in water-colours of an historical subject;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

147. For the best painting of a portrait in water-colours, being a miniature;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

148. For the best original painting in water-colours of a landscape;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

149. For the best original painting in water-colours of fruit or flowers;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

PAINTINGS IN OIL.

150. For the best original painting in oil-colours of an historical subject, consisting of not less than three figures;—the *Gold Medal.* For the next in merit, the *Gold Isis Medal.*

151. For the best original painting in oil-colours of a portrait;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

152. For the best original painting in oil-colours of a landscape;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

153. For the best original painting in oil-colours of fruit or flowers;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

154. For the best original painting in oil-colours of still-life;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

N. B. As the foregoing honorary premiums are intended only for the nobility and gentry, persons professing any branch of the polite arts, or any business dependent on the arts of design, or the sons and daughters of such persons, will not be admitted candidates in the above classes.

PREMIUMS FOR ARTISTS AND OTHERS.

HUMAN FIGURE.

155. For the best drawing in chalk, pencil, or Indian ink, copied from any picture, print, or drawing, by persons under the age of sixteen;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

156. For the best outline, drawn from any entire figure of the antique, or cast in plaster, the size of the drawing to be not less than twenty-four inches, to be accompained with a drawing of a hand and foot the size of life, by persons under the age of eighteen;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

157. For the best drawing from any entire antique figure, or from any cast in plaster, the size of the drawing to be not less than twenty-four inches, to be accompanied with a drawing of a hand and foot the size of life, by persons under the age of nineteen;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

158. For the best outline drawing of an entire anatomical human figure, from a model or cast, the size of the drawing to be not less than twenty-four inches, to be accompanied with a drawing of a hand and foot the size of life, by persons under the age of nineteen;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

159. For the best drawing from the living figure, the size of the drawing to be not less than twenty-four inches, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

160. For the best copy in water-colours from any picture, being a composition of two or more figures, the size of the principal figure not less than nine inches, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

161. For the best original drawing, being a composition of two or more figures, the principal figure not less than nine inches, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

162. For the best copy in oil from any picture, being a composition of two or more figures, the principal figure not less than twenty-four inches, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

163. For the best original painting in oil, being an historical composition, of not less than three figures, the principal figure not less than twenty-four inches high, and the size of the canvass to be a common half-length (or three feet four inches by four feet two inches); the subject *Mary Queen of Scots receiving the order for her execution;* by persons under the age of twenty-five;—the *Gold Medal.* For the next in merit, the *Gold Isis Medal.*

164. For the best original painting in oil, being an historical or poetical composition, of not less than three figures, the principal figure not less than twenty-four inches high; the size of the canvass to be a common half-length (or three feet four inches by four feet two inches), by persons under the age of twenty-five;—the *Gold Medal.* For the next in merit, the *Gold Isis Medal.*

HEADS OR PORTRAITS.

165. For the best drawing of a head, copied from any picture, drawing, or print, by persons under the age of sixteen;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

166. For the best finished drawing of a head, not less than the size of life, from any bust, by persons under the age of eighteen;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

167. For the best painting in oil, from an antique bust or cast, by persons under the age of nineteen;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

168. For the best original painting in water-colours of a portrait, or group of portraits, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

169. For the best portrait in miniature, in water-colours, being a copy, by persons under the age of twenty;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

170. For the best original portrait in miniature, in water-colours, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

171. For the best copy in oil, of a portrait, by persons under the age of nineteen;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

172. For the best original painting in oil of a portrait, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

MODELS.

173. For the best model in bass-relief, from any entire antique figure or cast in plaster, the size of the model not less than twenty-four inches, by persons under the age of eighteen;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

174. For the best model in bass-relief, from the living figure, by persons under the age of twenty-one, the model not less than twenty-four inches;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

175. For the best model of a bust from the antique, of a different size from the original, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

176. For the best model of a bust from nature, of the size of life,

by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

177. For the best model in the round, from an entire antique figure, the model not less than twenty-four inches high, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

178. For the best original model of a single figure, not less than twenty-four inches high, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

179. For the best original model of a group, the figures not less than twenty-four inches, by persons under the age of twenty-five;—the *Gold Medal.* For the next in merit, the *Gold Isis Medal.*

180. For the best coloured anatomical model of a dissected limb, or other part of the human body, natural or morbid, in wax or other substance;—the *Gold Medal.*

LANDSCAPE.

181. For the best drawing of a landscape, copied from any picture, drawing, or print, by persons under the age of eighteen;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

182. For the best original drawing of a landscape from nature, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

183. For the best original oil painting of a landscape from nature, by persons under the age of twenty-three;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

184. For the best original composition of a landscape painted in oil, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

185. For the best original marine painting, in oil, of two or more vessels, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

FLOWERS OR FRUIT.

186. For the best painting in water-colours, by persons under the age of sixteen;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

187. For the best original composition in water-colours, from nature, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

188. For the best original composition in oil, painted from nature, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

ANIMALS.

189. For the best drawing of one or more animals, copied from any picture, print, or drawing, by persons under the age of sixteen;—the *Silver Isis Medal.* For the next in merit, the *Silver Palette.*

190. For the best original drawing from nature of one or more animals, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

191. For the best original painting in oil, of a group of not less than three animals painted from nature, by persons under the age of

twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

STILL-LIFE.

192. For the best original composition, painted in oil or water-colours, of three or more such subjects as are usually called still-life, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

VIGNETTE.

193. For the best design for a vignette to be printed at the head of the Society's letters, &c.;—the *Gold Medal.*

The design to remain the property of the Society.

ARCHITECTURE.

Claims for the architectural premiums are to be sent in to the Society on or before the third Tuesday in January, 1825.

194. For the best drawing in perspective from a Corinthian capital, not less than eighteen inches high, by persons under twenty-one years of age;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

195. For the best design for a church of pure Doric architecture;—the *Gold Medallion.* For the next in merit, the *Silver Medal.*

The following inscription to be engraved on the medallion: "*The premium given by the Society for the encouragement of Arts, Manufactures, and Commerce, in conformity to the will of John Stock, Esq., of Hampstead.*"

It is recommended that the building resemble a Grecian temple as nearly as its adaptation to the purposes of a church will permit. The drawings sent in for this premium to consist of one or more plans, elevations, and perspective views, with separate representations of such parts as may be necessary to give a complete explanation of the design. The drawings to be made on a scale of one-eighth of an inch to a foot; the perspective view, and the particular parts, on a larger scale, if necessary.

The object of the Society, in offering this premium, is to promote the erection of such public buildings as would be an honour to the country.

196. For the best design in Greek architecture of an uniform building, fit for three or more dwelling houses, and adapted to the streets and squares of the metropolis, to consist of plan, elevation, and perspective view, on a scale of one-eighth of an inch to a foot, by persons under the age of thirty;—the *Gold Isis Medal.*

197. For the best perspective drawing of any public building in the United Kingdom, from actual elevations taken by measurement, and projected according to rule, drawn on large elephant paper, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

DRAWINGS OF MACHINERY.

198. For the best perspective drawing of machinery, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

ENAMEL PAINTING.

199. For the best enamel painting of a head, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

200. For the best historical painting in enamel, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

CARVING IN WOOD.

201. For the best carving in wood. of fruit or flowers, not less than nine inches high, by persons under the age of twenty-one;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

202. For the best carving in wood, of one or more animals, the size of the animal not less than eight inches, by persons under the age of twenty-three;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

203. For the best carving in wood, of one or more human figures, not less than a foot in height, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

204. For the best carving in wood, of any enriched border or ornamental design;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

ETCHING.

205. For the best free etching in historical composition, from a picture of eminence, by persons under the age of twenty-five;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

206. For the best free etching of a landscape, from a picture of eminence, by persons under the age of twenty-five;—the *Silver Medal.* For the next in merit, the *Silver Isis Medal.*

FINISHED ENGRAVINGS ON STEEL OR COPPER.

207. For the best finished engraving in historical composition, by persons under the age of thirty;—the *Gold Medal.* For the next in merit, the *Gold Isis Medal.*

208. For the best finished engraving of a landscape, by persons under the age of thirty;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

209. For the best finished engraving of a portrait, by persons under the age of thirty;—the *Gold Isis Medal.* For the next in merit, the *Silver Medal.*

210. For the best finished engraving on steel, in mezzotinto;—the *Gold Isis Medal.*

N. B. In the class of finished engravings the Society require an aquafortis impression, and a finished proof, to be sent, and to remain with the Society.

ENGRAVING ON BLOCKS.

211. For the best engraving on wood or metal blocks, of an historical subject, the size of the principal figure not less than six inches in height, and the block to be at least twelve inches by nine;—the *Gold Isis Medal.*

Two or more impressions, with the block, to be produced to the Society. The impressions, but not the block, to remain the property of the Society.

LITHOGRAPHY.

212. For the best specimen in this art;—the *Gold Isis Medal.*

The specimen to remain the property of the Society.

213. For the best account of the process employed in lithography superior to any hitherto known to the public;—the *Gold Isis Medal,* or *Thirty Guineas.*

The particulars of the process, accompanied by specimens of the art, and of the materials employed, with all other necessary information, to be produced to the Society on or before the first Tuesday in March, 1825.

214. For the best method of transferring drawings from the paper to the stone, for the purpose of lithography, superior to any hitherto in use;—the *Silver Medal*, or *Twenty Guineas*.

A complete account of the process employed, with specimens of the materials, to be produced to the Society.—Two specimens of the impression to remain with the Society.

MEDAL DIE ENGRAVINGS.

215. For the best die engraving either of a head or single figure, after the engraver's own design and model, by persons under the age of twenty-one;—the *Gold Isis Medal*. For the next in merit, the *Silver Medal*.

216. For the best die engraving of a group, after the engraver's own design and model, by persons under the age of thirty;—the *Gold Medal*. For the next in merit, the *Gold Isis Medal*.

The dies, with two impressions or casts, and the model, in each claim for medal die sinking, are to be produced to the Society, and the impressions or casts to remain the property of the Society.

217. To the person who shall discover and communicate to the Society a method of making and hardening medal dies, superior to any hitherto known, and which shall prevent the surface of the die from being cracked, scaled, warped, or otherwise injured;—the *Gold Medal*, or *Thirty Guineas*.

A full and detailed account of all the processes required to produce the effect, with certificates of their successful application, to be delivered to the Society.

GEM ENGRAVING.

218. For the best engraving in intaglio, of a head or single figure, on carnelian or other hard stone, being a copy;—the *Silver Medal*. For the next in merit, the *Silver Isis Medal*.

219. For the best engraving in intaglio, of a head or figure, after the engraver's own design and model, on carnelian or other hard stone;—the *Gold Isis Medal*. For the next in merit, the *Silver Medal*.

220 For the best engraving in intaglio of a group, after the engraver's own design and model, on carnelian or other hard stone;—the *Gold Medal*. For the next in merit, the *Gold Isis Medal*.

221. For the best engraving in cameo of a head or single figure, in carnelian or other hard stone, being a copy;—the *Silver Medal*. For the next in merit, the *Silver Isis Medal*.

222. For the best engraving in cameo of a head or figure, after the engraver's own design and model, on carnelian or other hard stone;—the *Gold Isis Medal*. For the next in merit, the *Silver Medal*.

223. For the best engraving in cameo of a group, after the engraver's own design and model, on carnelian or other hard stone;—the *Gold Medal*. For the next in merit, the *Gold Isis Medal*.

PREMIUM FOR MEDICAL OR SURGICAL STUDENTS,

224. For the best original drawing (made from actual dissection) of the anatomy of the human body, or of any part thereof, sufficiently full and accurate for the purposes of surgery, such drawing to be not less than the natural size of the parts, by persons under the age of twenty-five;—the *Silver Medal*. For the next in merit, the *Silver Isis Medal*.

It is required that each drawing be accompanied by an outline, with the necessary references to render the drawing intelligible.

CONDITIONS FOR THE POLITE ARTS.

All performances in the class of polite arts, except those relating to architectural subjects, are to be produced to the Society on or before the first Tuesday in March, 1825, and none can be received after that day.

No candidate, under any pretence whatever, shall be allowed to retouch or varnish a performance after it has been received by the Society.

No candidate having received a premium or bounty, shall receive an equal reward in the same class or an inferior reward in any class of the same department of art.

No more than one performance in each class shall be received from the same candidate.

No candidate shall receive more than one premium or bounty in the same year.

All performances to which premiums or bounties are adjudged, shall remain with the Society until after the second Wednesday in June, 1825, when they will be redelivered, unless mentioned in the premiums to the contrary.

No performance shall be admitted, that has obtained a reward from any other society, or academy.

All performances must have been executed within the year previous to their being sent in to the Society, except premium 195, and the finished engravings on steel and copper, which must have been executed within two years.

No performance can be received which does not come into one of the foregoing classes, and which does not agree with the conditions of the class in which it is introduced, except by a particular recommendation from the committee, and confirmed by the Society, that it is deserving of being made an exception to the general rule, and in such case a bounty may be given.

It is required, that the subjects for which premiums are offered, be delivered in without the names, or any external intimation to whom they belong; that the candidates affix on the front of their performances whatever mark they please, each performance having a different mark; and that the same mark be inscribed on the outside of a paper sealed up, containing within, the name and residence of the candidate, and *on the outside*, the sex, and age, and the number of the premium in claim of which the performance is offered, and whether the candidate has previously received from the Society any and what reward; the name not to be disclosed unless the candidate be successful, or in consequence of a special vote of the Society, or Committee.

If a person is a candidate in more than one class a separate letter must be sent in with each performance.

To encourage real merit, and to prevent attempts to impose on the Society, by producing drawings made or retouched by any other person than the candidate, the Society require a specimen of the abilities of each successful candidate to be made under the inspection of the committee of polite arts.

All copies are to be on a different scale from the original; and, if possible, the original is to be sent with the copy.

The Society reserve to themselves the power of giving medals of less value than those proposed; or of withholding them altogether in cases where the performance shall be deemed undeserving of reward. But if there should be in the same class more than two works of merit, deserving encouragement, the committee is allowed to recommend at the same time to the Society that a bounty be given; and in case of the second premium offered being the lowest reward which the Society gives, such lowest reward may be repeated as a bounty.

In consideration of the great number of premiums here offered, embracing so many departments of the fine arts, no bounty can be given, except by a special recommendation in cases of extraordinary merit; the reason of such recommendation to be particularly stated in the report of the committee.

PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

FINE WOOL.

225. To the person who shall have produced from his own flock, in the year 1824, the greatest quantity, not less than 5 Cwt. of wool

equal to the Spanish merino, and as fit for the purpose of being manufactured into superfine cloth;—the *Gold Medal.*

Certificates, along with samples of the wool, and of the cloth manufactured from it, to be produced to the Society on or before the first Tuesday in February, 1825.

226. For the next greatest quantity, not less than two hundred and fifty pounds;—the *Silver Medal,* on similar conditions.

TRANSPARENT PAPER.

227. To the person who shall discover to the Society a method of making transparent paper, better than any hitherto in use, and that shall take and bear common writing-ink with the same facility and correctness as writing paper;—the *Silver Medal,* or *Twenty Guineas.*

Certificates of the making such paper, an account of the process, and one ream of the paper, to be produced to the Society on or before the second Tuesday in February, 1825.——[China Paper, see premium 293.]

LEATHER FOR GLOVES.

228. To the person who shall make known to the Society a process equal or superior to that of the French, for preparing, dyeing, and finishing skins, for fine gloves, verified by actual experiment, and the communication accompanied with at least a dozen pair of gloves made from skins so prepared;—the *Gold Medal,* or *Forty Guineas.*

Certificates from competent persons, fully approving of the result of such experiments, together with the gloves and communication, to be produced to the Society on or before the last Tuesday in February, 1825.

HOSE FOR FIRE-ENGINES, BREWHOUSES, &c.

229. To the person who shall invent and make known to the Society a method of making hose for fire-engines, brewhouses, &c. similar to those used on the continent, made of flax or hemp, or other flexible material cheaper than leather;—the *Gold Isis Medal,* or *Thirty Guineas.*

A full account of the process used in manufacturing it, with certificates of its efficacy in practice, to be produced to the Society on or before the last Tuesday in February, 1825.

THREAD FOR LACE.

230. To the person who shall invent and discover to the Society a method of manufacturing thread from flax, of as fine quality as any used on the continent;—the *Gold Medal,* or *Thirty Guineas.*

Samples of the thread, not less than one pound in weight, and of the lace made therefrom, together with certificates that not less than ten pounds in weight have been manufactured, to be produced to the Society on or before the last Tuesday in February, 1825.

SHAWLS OF CACHEMIRE WOOL.

231. To the person who shall manufacture and produce to the Society a shawl made entirely of Cachemire wool, and which shall be the best imitation of the real Indian shawls, made from the same material;—the *Gold Medal,* or *Thirty Guineas.*

Certificates from competent persons approving the articles manufactured, with a full account of the process employed therein, to be produced to the Society on or before the last Tuesday in February, 1825.

SHAWLS IN IMITATION OF CACHEMIRE.

232. To the person who shall manufacture, of any material except Cachemire wool, and produce to the Society a shawl equal in beauty, and in fineness of texture, to the best Indian shawls made of Cachemire wool;—the *Gold Medal,* or *Thirty Guineas.*

Conditions the same as for the preceding.

WINDING SILK.

233. To the person who shall invent and produce to the Society a method, better than any hitherto known, of winding raw silk that is in any degree sticky in its gum, or brittle in its texture, without injuring its colour or texture, or altering its weight, and at a cost not exceeding that of the ordinary methods;—the *Silver Medal,* or *Twenty Guineas.*

A full description of the process, and apparatus used, and samples of the silk, both in its wound and raw state, together with certificates of the process having answered the required conditions, to be produced to the Society on or before the last Tuesday in February, 1825.

ORGANZINE SILK.

234. To the person who shall invent and produce to the Society a method by which to organzine silk equal in quality to the Italian throw, at an expense not more than two-thirds of the current price of throwing;—the *Gold Medal,* or *One Hundred Guineas.*

The communication, with a full description of the process, and models or drawings of the apparatus employed, and samples of the produce, with certificates of the invention answering the required conditions, to be produced to the Society on or before the second Tuesday in February, 1825.

PREVENTING THE WATERING OF PLAIN SILKS.

235. To the person who shall invent a method of preventing plain silks from being watered in the loom, without the use of a knee-roll;—the *Silver Medal,* or *Fifteen Guineas.*

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the last Tuesday in March, 1825.

MACHINE FOR SILK WEAVING.

236. To the person who shall invent, and produce to the Society, a machine for weaving figured silks, superior in its mode of action, and in the nature and extent of the work it will produce, to the looms at present known;—the *Gold Medal,* or *Fifty Guineas.*

Certificates of the performance of the machine, and a model of the same, to be produced to the Society on or before the last Tuesday in March, 1825.

MACHINE FOR WEAVING RIBBONS.

237. To the person who shall invent and produce to the Society a machine for weaving figured ribbons, superior in the nature and extent of the work performed to the looms at present known;—the *Gold Vulcan Medal,* or *Thirty Guineas.*

The improved plan to be capable of producing ribbons equal in texture to those of French manufacture, and to perform well in every respect. The entire height of the loom and its appendages not to exceed eight feet. The communication, together with specimens of the ribbons made with the improved loom, to be produced to the Society on or before the first Tuesday in February, 1825.

POWER LOOMS FOR FIGURED SILK OR RIBBONS.

238. To the person who shall invent and produce to the Society a machine for weaving figured silks or ribbons, by which the best sorts of works may be executed, and to which steam, or any similar power may be applied;—the *Gold Medal,* or *Fifty Guineas.*

Conditions the same as the last.

HAT OR BONNET FROM INDIGENOUS BRITISH GRASS.

239. To the person who shall manufacture, or cause to be manufactured, and shall produce to the Society, on or before the first Tuesday in February, 1825, the best hat or bonnet, made from indigenous

British grass, that shall be equally good in texture and colour as those imported from Leghorn;—the *Silver Medal*, or *Fifteen Guineas*. For the next in merit, the *Silver Ceres Medal*, or *Ten Guineas*.

PLAT FROM NEW ENGLAND GRASS.

240. To the person who shall manufacture, or cause to be manufactured, and shall produce to the Society, on or before the first Tuesday in February, 1825, the largest quantity (not less than fifty score) of plat fit for manufacturing bonnets, equal in texture to that imported from Leghorn, from the New England grass, raised in Great Britain, seeds of which have been imported and distributed by the Society;—the *Silver Medal*, or *Fifteen Guineas*.

HAT OR BONNET FROM NEW ENGLAND GRASS.

241. To the person who shall manufacture, or cause to be manufactured, and shall produce to the Society, on or before the first Tuesday in February, 1825, the greatest quantity (not less than six) of hats or bonnets, equal in colour and texture to those imported from Leghorn, manufactured from the New England grass as above, raised in Great Britain;—the *Silver Medal*, or *Fifteen Guineas*.

MATTING.

242. To the person who shall manufacture and produce to the Society, the best specimen of matting, resembling India matting, used for covering rooms, and made from materials grown in Great Britain;—the *Silver Medal*, or *Twenty Guineas*.

Certificates that not less than fifty yards of this matting have been manufactured, and that it will answer the purpose of India matting, and can be afforded at a less price, together with a sample of not less than six yards, and a complete account of the process of manufacture, to be produced to the Society on or before the first Tuesday in February, 1825.

PREMIUMS IN MECHANICS.

GUNPOWDER MILLS.

243. To the person who shall invent and discover to the Society the most effectual mode of preventing explosions in gunpowder mills;—the *Gold Medal*, or *One Hundred Guineas*.

Certificates and accounts of the method having been put in practice in one or more gunpowder mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1825.

N. B. As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of gunpowder-making which fall short of the total prevention of explosion, such bounty or reward will be bestowed on them as they may appear to merit.

FAMILY OR PORTABLE MILL.

244. To the person who shall invent and produce to the Society a mill for grinding corn for the use of private families or parish poor; the construction to be simple, the mill to be easily worked, and superior to any hitherto in use;—the *Gold Medal*, or *Thirty Guineas*.

The mill, and certificates of its having been used to good effect, to be produced to the Society on or before the last Tuesday in February, 1825. Cheapness and simplicity will be considered as essential parts of its merit; and the mill, or a model, to remain with the Society.

MACHINE FOR RAISING COALS, ORE, &c. &c. &c.

245. To the person who shall invent and produce to the Society a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use, and which shall produce the effect at less expense;—the *Gold Medal*, or *Fifty Guineas*.

A model, with a certificate that a machine at large, on the same construction, has been advantageously used, to be produced to the Society on or before the second Tuesday in February, 1825.

IMPROVED WALKING-WHEEL, OR CRANE.

246. To the person who shall invent an improved walking-wheel, or crane, on which the weight or power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or less weight to be raised or lowered;—the *Gold Medal*, or *Thirty Guineas*.

A model, with a certificate that the machine at large has been employed to good effect, to be produced to the Society on or before the second Tuesday in Feb. 1825.

MACHINE FOR RAISING WATER.

247. To the person who shall invent a machine on a better, cheaper, and more simple construction than any hitherto known for raising water out of wells, &c. from a depth of not less than fifty feet;—the *Gold Medal*, or *Thirty Guineas*.

Certificates of the performance of the machine, and a model of it, to be produced to the Society on or before the last Tuesday in February, 1825.

EXTINGUISHING FIRES.

248. To the person who shall produce to the Society a method for preventing or extinguishing fire in buildings, superior to any now in use;—the *Gold Medal*, or *Thirty Guineas*.

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the last Tuesday in January, 1825.

This premium is offered in compliance with a recommendation in the will of the late Dr. Anthony Fothergill.

BORING AND BLASTING ROCKS.

249. To the person who shall discover to the Society a more simple, safe, cheap, and expeditious method than any hitherto known or in use, of boring and blasting rocks in mines, shafts, wells, &c.;—the *Gold Medal*, or *Thirty Guineas*.

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the first Tuesday in February, 1825.

HEATING ROOMS FOR THE PURPOSE OF MANUFACTURES.

250. To the person who shall invent and discover to the Society a method of heating rooms, superior to and cheaper than any hitherto known or in use, for the purpose of manufacturers;—the *Gold Medal*, or *Thirty Guineas*.

A model or complete drawing and description of the method, with certificates that it has been successfully practised, to be delivered to the Society on or before the first Tuesday in February, 1825.

IMPROVED VENTILATION.

251. To the person who shall invent and produce to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used;—the *Gold Medal*, or *Fifty Guineas*.

A model of the apparatus, and a full account of the means by which the effect has been produced, with proper certificates, to be delivered to the Society on or before the last Tuesday in February, 1825.

VENTILATING COAL MINES.

252. To the person who shall invent and carry into practice a method of ventilating coal mines so as effectually to prevent the accidents liable to arise from the accumulation of carburetted hydrogen and other gases;—the *Gold Medal*, or *Fifty Guineas*.

A full account of the process, with certificates of its efficacy, to be produced to the Society on or before the last Tuesday in February, 1825.

N. B. The Society will be very glad to attend to any communication, which, though not completely effecting the object, appears to offer an approximation to it. The Society wish particularly to refer candidates for this premium to the communication made by Mr. Ryan, and published in the 34th vol. of the "Transactions;" and will consider themselves obliged to any person who will furnish any information with respect to the attempts which have been made to introduce Mr. Ryan's mode of ventilating coal mines into actual use, and of the success with which this method has been attended.

PREVENTING ACCIDENTS FROM STAGE-COACHES.

253. To the person who shall invent and discover to the Society a method of preventing accidents arising from stage coaches;—the *Gold Medal*, or *Thirty Guineas*.

Ample certificates of its efficacy, and a description of the method, with models of the machinery used, to be produced to the Society on or before the last Tuesday in February, 1825.

N. B. The Society wish to impress strongly on the public the necessity of turning their attention to the above premium, from the number of accidents that daily occur; and suggest whether they might not, in some degree, be prevented by an alteration in the manner of placing the luggage.

PREVENTING ACCIDENTS FROM HORSES FALLING WITH TWO-WHEELED CARRIAGES.

254. To the person who shall invent and produce to the Society a method, superior to any hitherto known or in use, of preventing accidents from the falling of horses with two-wheeled carriages, especially on steep declivities;—the *Gold Medal*, or *Thirty Guineas*.

A model of the apparatus, and a full account of the means by which the effect has been produced, with proper certificates that the same has been used with success, to be delivered to the Society on or before the second Tuesday in Feb. 1825.

IMPROVING TURNPIKE AND OTHER ROADS.

255. To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiment, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat, or any other mode, so as to form an even, hard, and durable carriage-road;—the *Gold Medal*, or *Thirty Guineas*.

It is required, that an accurate account of the method used, and every expense attending it, together with satisfactory certificates of its being effectual, be delivered to the Society on or before the first Tuesday in February, 1825.

RAISING THE BODIES OF PERSONS WHO HAVE SUNK UNDER WATER.

256. To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water;—the *Gold Medal*, or *Thirty Guineas*.

The drag or machine, to be produced to the Society on or before the first Tuesday in February, 1825.

PREVENTING PREJUDICIAL EFFECTS TO THE PERSONS EMPLOYED IN DRY-GRINDING.

257. To the person who shall invent and produce to the Society a mode of obviating the prejudicial effects that attend the operation of pointing needles, and other branches of dry-grinding, during which the particles of grindstone-dust, steel, and iron, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders;—the *Gold Medal*, or *Thirty Guineas*.

A model of the apparatus, and a full account of the means by which the effect has been produced, together with proper certificates of its practicability and adoption, to be delivered to the Society on or before the first Tuesday in February, 1825.

PREVENTING EXPLOSION IN STEAM-ENGINE AND OTHER CLOSED BOILERS.

258. To the person who shall invent and discover to the Society a method of rendering closed boilers used for steam-engines and other purposes safer than any now in use, and less liable to accidents from explosion;—the *Gold Medal, and not less than Thirty Guineas.*

Ample certificates that the method has been found to answer its intended purpose, to be produced to the Society on or before the last Tuesday in February, 1825.

AN ORIGINAL SCREW.

259. To the person who shall invent and make known to the Society any mode of producing an original screw more perfect than any hitherto known;—the *Gold Medal*, or *Thirty Guineas*.

A model or complete drawing and description of the method, with a screw n less than twelve inches in length, to be produced to the Society on or before th first Tuesday in February, 1825.

WORKING DRAWINGS OF A STEAM-ENGINE.

260. To the person who shall produce to the Society the best working drawings, in plan, elevation, and section, of a condensing steam-engine in its most improved state, with a full detail of its several parts, and an accurate description thereof;—the *Gold Vulcan Medal*, or *Thirty Guineas*.

The drawings and description to be produced to the Society on or before the first Tuesday in March, 1825; and, if rewarded, to remain the property of the Society.

CANAL LOCKS.

261. To the person who shall invent and communicate to the Society a plan of a lock for a canal, by which, on the passing of a boat, less water may be expended than has hitherto been the case, and through which a boat may pass in a time not materially longer than is required for passing locks of the usual construction;—the *Gold Medal*, or *Fifty Guineas*.

Certificates of the plan having been successfully carried into practice, together with a full description, and drawings or models in illustration of the same, to be sent to the Society on or before the first Tuesday in March, 1825.

PASSING BOATS THROUGH TUNNELS.

262. To the person who shall invent and communicate to the Society a method whereby a boat may be impelled or drawn through a tunnel not having a towing path, superior to those usually in practice, at an easy expense, and without injury to the tunnel;—the *Gold Medal*, or *Thirty Guineas*.

Conditions the same as the last.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE AND THE BRITISH COLONIES.

TAKING PORPOISES.

263. To the people in any boat or vessel, who, in the year 1824, shall take the greatest number of porpoises, not fewer than thirty, on the coast of Great Britain or Ireland, for the purpose of extracting oil from them;—the *Gold Medal,* or *Thirty Guineas.*

Certificates of the number, signed by the persons to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in February, 1825.

OIL FROM PORPOISES OR SUN-FISH.

264. To the person who shall manufacture the greatest quantity of oil from porpoises or sun-fish, taken on the coast of Great Britain or Ireland, in the year 1824, not less than twenty tons;—the *Gold Medal,* or *Thirty Guineas.*

Certificates of the oil having been made from porpoises or sun-fish actually caught on the coast of Great Britain or Ireland, and two gallons of the oil, as a sample, to be produced to the Society on or before the last Tuesday in February, 1825.

CURING MACKAREL.

265. To the person who shall, in the year 1824, cure the greatest quantity of mackarel, not less in number than ten thousand, in the best manner, and to the satisfaction of the Society, the same being caught in the British or Irish seas, and cured in a British or Irish vessel or port;—the *Gold Isis Medal,* or *Twenty-five Guineas.*

266. For the next greatest quantity, not less than five thousand;—the *Silver Medal,* or *Fifteen Guineas.*

A sixteen gallon barrel of the mackarel to be produced to the Society on or before the first Tuesday in January, 1825, with certificates that the conditions of the premium have been fulfilled, and that the whole were cured in the same manner as the specimens, together with a full description of the process employed.

The same premiums to be extended one year farther, on similar conditions.

N. B. Specimens of cured mackarel, which promise to afford a most valuable article of trade and food, even superior to herrings, have been sent to the Society, and have induced them to turn the attention of the public thereto, by offering the above premiums.

NUTMEGS, MACE, CINNAMON, AND CLOVES.

267. To the person who shall grow the greatest quantity of merchantable nutmegs, mace, cinnamon, or cloves, not less than twenty pounds weight, in any part of his majesty's dominions in the West Indies, or in any British plantation on the coast of Africa, or of the several islands adjacent thereto, or in the island of Sincapore, and equal to those imported from the islands of the East Indies;—the *Gold Medal,* or *Fifty Guineas.*

Satisfactory certificates from the governor, commander-in-chief, resident magistrates, or other competent local authorities, of the place of growth, with an account of the number of trees, their age, nearly the quantity of fruit on each tree, and the manner of culture, together with samples, to be produced on or before the first Tuesday in January, 1825.

The same premium is offered for the year 1826.

KALI FOR BARILLA.

268. To the person who shall have cultivated, in the Bahama islands, or any other part of his majesty's dominions in the West

Indies, or in any other British plantation, in the year 1824, the greatest quantity of land, not less than two acres, with a kali equal to the Spanish kali for the purpose of making barilla;—the *Gold Medal*, or *Thirty Guineas*.

269. For the next greatest quantity, not less than one acre;—the *Silver Medal*, or *Fifteen Guineas*.

Certificates, signed by the governor or commander-in-chief for the time being, the resident magistrates, or other competent local authorities, of the quantity of land so cultivated, and of the state of the plants at the time of signing such certificates, to be delivered to the Society, with samples of the kali, on or before the second Tuesday in February, 1825.

The same premiums, on similar conditions, will be given for barilla grown in 1825.

DESTROYING THE INSECT COMMONLY CALLED THE BORER.

270. To the person who shall communicate to the Society an effectual method of destroying the insect commonly called the borer, which is so destructive to the sugar canes in the West India islands;—the *Gold Medal*, or *Fifty Guineas*.

The discovery to be ascertained by satisfactory certificates, under the hand and seal of the governor or commander-in-chief for the time being, of the resident magistrates or other competent local authorities, and of some other respectable persons, inhabitants of the islands, or other place, in which the remedy has been successfully applied; such certificates to be delivered to the Society on or before the first Tuesday in February, 1825.

CULTIVATION OF HEMP IN UPPER AND LOWER CANADA, NOVA SCOTIA, AND NEW BRUNSWICK.

271. To the person who shall sow with hemp the greatest quantity of land in the above-mentioned provinces, not less than six arpents, (each four-fifths of a statute acre) in the year 1824, and shall at the proper season cause to be plucked the summer hemp, (or male hemp bearing no seed), and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe;—the *Gold Medal*, or *Two Hundred Dollars*.

272. To the person who shall sow with hemp the next greatest quantity of land in the same provinces, not less than five arpents, in the year 1824, in the manner above-mentioned;—the *Silver Medal*, or *One Hundred Dollars*.

Certificates of the number of arpents, the method of culture, of the plucking of the hemp, with a general account whether sown broad-cast or in drills, and of the expense, soil, cultivation, and produce, to be transmitted to the Society, certified under the hand and seal of the governor or lieutenant-governor, of the resident magistrates or other competent local authorities, together with 28 lb. of the hemp, and two quarts of the seed, on or before the last Tuesday in April, 1825.

IMPORTATION OF HEMP FROM CANADA, NOVA SCOTIA, AND NEW BRUNSWICK.

273. To the person who shall import to this country the greatest quantity of marketable hemp, not less than one hundred tons, in the year 1824, the produce of Canada, or of one of the above-mentioned provinces;—the *Gold Medal*.

274. To the person who shall import the next greatest quantity, not less than fifty tons;—the *Silver Medal*.

Certificates, satisfactory to the Society, to be produced by the master of the vessel on or before the last Tuesday in April, 1825, to testify that such hemp was grown and prepared in Canada, Nova Scotia, or New Brunswick.

SUBSTITUTE FOR HEMP.

275. To the person who, in the years 1824, or 1825, shall raise

at the Cape of Good Hope, in New South Wales, or in any of the British colonies, and import, a substitute for hemp, not less than two tons, equally cheap, strong, durable, and applicable to all the purposes for which hemp is now used;—the *Gold Medal*, or *Fifty Guineas.*

A quantity of the substitute, not less than 20 lbs., together with the proper certificates from the governor, commander-in-chief, secretary of the colony, resident magistrates, or other competent local authority, in which the same has been raised, to be produced to the Society on or before the last Tuesday in February, 1825.

The Society particularly direct the attention of the public to the phormium tenax or New Zealand flax.

N. B. The premiums from No. 268 to 273 are all extended one year farther on similar conditions.

SILK.

276. To the person who, in the years 1824, 5, or 6, shall raise in any British colony, and import, the greatest quantity of silk proper for manufactures, not less than one hundred pounds weight, from silk-worms bred there;—the *Gold Medal*, or *Fifty Guineas.*

Specimens of the silk, not less than one pound, with an account of the method in which the silk-worms were managed, the kind of mulberry trees from whence they were furnished with food, and particulars respecting the culture of the mulberry trees for that purpose, with satisfactory certificates, to be produced to the Society on or before the first Tuesday in February, 1825, 6, or 7.

277. For the next greatest quantity, not less than fifty pounds, on similar conditions;—the *Silver Medal*, or *Twenty Guineas.*

The same premiums are specially offered for the colonies of

278—279. The Cape of Good Hope;

280—281. The Mauritius;

282—283. New South Wales.

COCOA-NUT OIL.

284. To the person who shall, in the year 1824, import the largest quantity of cocoa-nut oil, not lest than fifty tons, and of the best quality;—the *Gold Medal*, or *Thirty Guineas.*

Proper certificates, with the bills of lading, and samples of the oil, to be produced to the Society on or before the last Tuesday in February, 1825.

This premium is proposed particularly with a view to encourage the use of cocoanut oil in the making of gas for the purpose of illumination, such gas having been found much superior to the gases commonly in use.

OLIVE OIL.

285. To the person who shall, in the years 1826, 1827, or 1828, manufacture and import the finest specimen of oil, not less than ten gallons, the produce of olives grown in any British colony in Africa or New South Wales;—the *Gold Medal.*

286. For the next greatest quantity, not less than six gallons;—the *Silver Medal.*

Specimens of the oil, not less than two quarts, together with satisfactory certificates, to be produced to the Society on or before the last Tuesday in February, 1826, 7, or 8.

WINE FROM THE CAPE OF GOOD HOPE.

287. To the person who shall import, in the years 1824, 1825, or 1826, the finest wine, not less than twenty gallons, of good marketable quality, made from the produce of vineyards at the Cape of Good Hope, or the parts adjacent;—the *Gold Medal.*

The above premium is not offered for the sweet or Constantia wine, the quality and value of which are sufficiently known, but to encourage the improvement of the vineyards more recently established.

Samples of the wine, in bottles, bills of lading, and certificates of the governor, secretary of the colony, or other local authorities, that the wine was made in the colony, to be produced to the Society on or before the first of March, 1825, 6, or 7.

WINE FROM NEW SOUTH WALES.

288. To the person who shall import, in the years 1825, 1826, or 1827, the finest wine, not less than twenty gallons, of good marketable quality, made from the produce of vineyards in New South Wales;—the *Gold Medal.*

Conditions the same as in the preceding article.

FINE WOOL FROM NEW SOUTH WALES.

289. To the person who shall produce to the Society the finest sample of wool, the produce of New South Wales, equal to the best Saxon;—the *Gold Medal.*

Not less than 14 lbs. of the wool to be produced to the Society on or before the last Tuesday in February, 1825, together with certificates that at least 5 cwt., equal to the sample, has been imported by the claimant.

CACHEMIRE WOOL.

290. To the person who shall import the greatest quantity of real Cachemire wool, not less than one cwt., freed from the hair, and in a state fit for spinning;—the *Gold Medal.*

Samples of the wool, not less than five pounds weight, with bills of lading, and other necessary documents to be produced to the Society on or before the last Tuesday in February, 1825.

This premium is continued two years longer on similar conditions.

IMPORTING THE CACHEMIRE-SHAWL GOAT.

291. To the person who shall have imported into the United Kingdom, subsequent to the 1st of January, 1824, the greatest number, not fewer than three females and two males, of the real Cachemire-shawl goat;—the *Gold Medal.*

Certificates that the goats are of the real Cachemire breed, and that they are in health at the time of making the communication, to be produced to the Society on or before the first Tuesday in February, 1825.

This premium is offered also for the years 1825 and 1826.

CHINA PAPER FOR COPPER-PLATE PRINTING.

292. To the person who shall communicate to the Society the best account of the process employed in China for the manufacture of paper used in England for copper-plate printing, and known by the name of India paper, together with an account of the materials from which such paper is made;—the *Gold Medal,* or *Fifty Guineas.*

Specimens of the paper, not less than one ream, with samples of the materials in their raw or unmanufactured state, and satisfactory certificates, to be produced to the Society on or before the first Tuesday in February, 1825, or 1826.

ANNATTO.

293. To the person who, in the year 1824, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of annatto, equal to that imported from Spanish America, not less than one cwt.;—the *Gold Medal.*

A quantity of the annatto, not less than ten pounds weight, to be produced to the Society, with proper certificates, signed by the governor or secretary of the respective settlement, that the annatto is the produce of such settlement, on or before the last Tuesday in February, 1825.

TRUE COCHINEAL.

294. To the person who, in the year 1824, shall import into the port of London, from any part of the British settlements in the East or West Indies, or any other British plantation, the greatest quantity of true cochineal, equal to that imported from Spanish America, not less than one hundred weight;—the *Gold Medal.*

A quantity of cochineal, not less than three pounds weight, with proper certificates, signed by the governor or secretary of the respective settlement, or other competent local authority, that the cochineal is the produce of such settlement, to be produced to the Society on or before the first Tuesday in February, 1825.

N. B. The premiums from No. 289 to 291 inclusive, are all extended two years farther on similar conditions.

SHORT-REELED BRUTIA SILK.

295. To the person who, previous to the first of March, 1825, shall have imported into Great Britain the greatest quantity of Brutia or Levant silk, not less than five bales (heretofore long-reeled), of a reel not more than 75 inches in circumference, so as to be wound by the engines in ordinary use;—the *Gold Isis Medal*, or *Thirty Guineas.*

Proper certificates, with bills of lading, and samples of the silk, to be produced to the Society on or before the first Tuesday in March, 1825.

WEST INDIA INDIGO.

296. To the person who, in the year 1825, shall raise the greatest quantity of indigo of good quality, not being less than one thousand pounds weight, in the island of Jamaica, or any other British plantation in the West Indies;—the *Gold Medal*, or *Fifty Guineas.*

Certificates from the governor or secretary of the colony, or from the justices of the peace, or other competent local magistrates, that the indigo was raised in the colony, together with samples, to be produced to the Society on or before the first Tuesday in December, 1826.

CULTIVATION OF TEA.

297. To the person who shall grow and prepare the greatest quantity of China tea, of good quality, not being less than 20 lbs. weight, in the island of Jamaica, or in any other British West India colony, and shall import the same into Great Britain;—the *Gold Medal*, or *Fifty Guineas.*

Satisfactory certificates from the governor or secretary of the colony, or from the justices of the peace, or any other competent local magistrate, that such tea was grown and prepared in the colony; together with an account of the number of tea-trees, their age, mode of culture, of gathering, drying, and preparing the leaves, and samples of the tea, to be produced to the Society on or before the first Tuesday in February, 1827.

The same premium is offered for the colonies of

298. The Cape of Good Hope;

299. The Mauritius;

300. New South Wales.

CHINA TEA.

301. To the person who shall communicate to the Society, from information obtained in China, the best and most authentic account of the culture of the plant or plants, the leaves of which furnish the different kinds of tea; together with the method of gathering, drying, and otherwise preparing the leaves;—the *Gold Medal.*

The communication, with the necessary certificates, to be sent in to the Society on or before the first Tuesday in March, 1825.

This premium is extended to the years 1826 and 1827.

DRIED FRUITS.

302. To the person who shall prepare and import into Great Britain the greatest quantity, not less than 100lbs. of dried fruits, similar to those now imported from the Mediterranean, of good quality, and the growth of the colony of New South Wales;—the *Gold Ceres Medal.*

Satisfactory certificates from the governor or secretary of the colony, or any competent local magistrate, that the fruits were grown and prepared in the colony, with samples of the fruits, to be presented to the Society on or before the first Tuesday in February, 1826.

This premium is also extended to 1827.

The same premium on similar conditions is offered for the colonies of

303. The Cape of Good Hope.

304. The Mauritius.

EXTRACT OF MIMOSA BARK.

305. To the person who, in the year 1824, shall import into Great Britain the greatest quantity (not less than one ton), of extract of mimosa bark, prepared in the colony of New South Wales, at a price not greater than that of the extract of foreign oak-bark, and equally applicable as that to the purpose of tanning;—the *Gold Isis Medal.*

Satisfactory certificates, together with a full account of the process of preparing the extract, and samples thereof, to be produced to the Society on or before the last Tuesday in January, 1825.

This premium is extended to the year 1826.

DIMINUTION OF HUMAN LABOUR IN THE CULTIVATION OF SUGAR, &c.

306. To the person who, previous to the first of January, 1825, shall present to the Society a satisfactory account, founded on experience, of the most advantageous mode of diminishing the labour of persons employed in the cultivation of sugar, cotton, and coffee in the West Indian colonies, by the substitution of agricultural machinery or by the use of cattle;—the *Gold Medal*, or *Fifty Guineas.*

This premium is extended to the year 1826.

EXTIRPATING THE STUMPS AND ROOTS OF TREES.

307. To the person who shall invent and discover to the Society the best method, verified by actual experience, of raising out of the earth and removing the stumps and roots of trees which have been left after felling the timber, so as to clear the land for the purposes of cultivation;—the *Gold Medal*, or *Fifty Guineas.*

Certificates that the method has succeeded with at least fifty trees of large girth, and a full description of the means employed, to be delivered to the Society on or before the last Tuesday in February, 1825.

BRITISH MARBLES.

THE Society, considering that it would be beneficial to the commerce of the United Kingdom to bring the British marbles into general use, and that the most effectual method of accomplishing their object would be, *for the present*, to make them more generally known in the capital, have come to the following resolution:—

That specimens of British marbles be exposed in the Society's rooms, in the Adelphi, for the inspection of the public under the following regulations:

1st, That all the specimens be exact to a given size, viz. eight inches high, six inches broad, one thick, and polished on one face.

2nd, That a book be kept, containing the number of each specimen, and describing the situation of the quarry, the name and situation of the parish, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future enquiries.

As the exertions of the Society can be generally beneficial only inasmuch as their views are seconded by the public, the Society request, that all proprietors of marble quarries will favour them with a specimen of the marble, worked to the exact size above-mentioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public. By such arrangements, it is expected, that the interest of the proprietors of the quarries will be promoted, and the use of British marble much extended. A variety are already exhibited in the Society's rooms.

REWARDS

BESTOWED BY THE SOCIETY DURING THE SESSION

WHICH COMMENCED ON THE FIRST WEDNESDAY IN NOVEMBER, 1823, *AND CLOSED ON THE SECOND WEDNESDAY IN JUNE,* 1824.

IN AGRICULTURE AND RURAL ECONOMY.

1. To Philip Hurd, Esq., Kentish Town-house, for raising oaks for timber, the *large Gold Medal.*
2. To Henry Blyth, Esq., Burnham, Norfolk, for embanking two hundred and fifty-three acres of marsh land from the sea, the *large Gold Medal.*
3. To Messrs. Cowley and Staines, Winslow, Bucks, for cultivating twelve acres of poppies, and obtaining therefrom 196 lbs. of opium, *Thirty Guineas.*

IN CHEMISTRY.

1. To Mr. R. W. Dickinson, Albany Brewery, Kent-road, for a machine for clearing beer while in fermentation, the *large Silver Medal.*
2. To Mr. H. Wilkinson, 12, Ludgate-hill, for an improved safety chamber to the oxy-hydrogen blowpipe, the *large Silver Medal.*
3. To Mr. T. Griffiths, Church-street, Kensington, for an improved stop-cock for chemical purposes, the *Silver Vulcan Medal.*
4. To Mr. G. Chapman, of Whitby, for a mode of consuming the smoke of steam engine boilers, the *large Silver Medal.*

IN POLITE ARTS.

ORIGINAL OIL PAINTINGS.

1. To Mr. E. Knight, Jun., Covent Garden Chambers, for a landscape, the *Gold Isis Medal.*
2. To Mr. J. P. Andre, Jun., 5, York-place, City-road, for a landscape, the *Silver Isis Medal.*
3. To Miss A. Robertson, Tweedmouth, Berwick, for a portrait, the *Silver Isis Medal.*
4. To Miss A. Eggbrecht, 16, Frith-street, Soho, for a portrait, the *Silver Palette.*
5. To the same, for a composition in still-life, the *Silver Isis Medal.*
6. To Miss Jesse Robertson, Tweedmouth, Berwick, for a landscape, the *Silver Palette.*
7. To Mr. Evan Williams, 6, Charlotte-street, Bloomsbury, for a portrait, the *large Silver Medal.*
8. To the same, for a composition in still-life, the *large Silver Medal.*
9. To Mr. Henry Johnson, 7, Rodney-buildings, New Kent-road, for a portrait, the *Silver Isis Medal.*
10. To Mr. H. Pearsall, 13, Kingswood-terrace, Bath, for a landscape, a composition, the *large Silver Medal.*
11. To Mr. J. M. Gilbert, 9, Hope-square, Clifton, for a view of shipping, the *Gold Isis Medal.*
12. To Mr. J. Eggbrecht, 16, Frith-street, Soho, for a composition in still-life, the *Silver Isis Medal.*
13. To Mr. W. Gill, 16, Wilmot-street, Brunswick-square, for a composition in still-life, the *Silver Palette.*
14. To Mr. H. C. Slous, 6, Bayham-street, Camden Town, for an historical composition, the *large Gold Medal.*

COPIES IN OIL.

15. To Mr. G. Hilditch, 13, Ludgate-hill, for an historical subject, the *Silver Isis Medal.*
16. To Miss A. Robertson, Tweedmouth, Berwick, for an historical subject, the *large Silver Medal.*
17. To. Mr. J. W. Solomon, 86, Piccadilly, for an historical subject, the *large Silver Medal.*

18. To Mr. J. Sargeant, 4, Burlington-place, Kent-road, for an historical subject, the *Silver Palette.*

19. To Mr. J. Eggbrecht, 16, Frith-street, Soho, for a portrait, the *Silver Isis Medal.*

ORIGINAL PAINTINGS IN WATER COLOURS.

20. To Miss M. Smith, 16, Bucklersbury, for a miniature portrait, the *Silver Isis Medal.*

21. To Miss Eliz. Twining, 34, Norfolk-street, Strand, for a composition of flowers, the *large Silver Medal.*

22. To Miss Fr. Strickland, Henley Park, for a composition of flowers, the *Gold Isis Medal.*

23. To Miss A. L. Napier, Woolwich Common, for a composition of fruit, the *Silver Palette.*

24. To Miss M. J. Hull, Beverley, for a composition of flowers, the *Silver Palette.*

COPIES IN WATER COLOURS.

25. To Miss Twining, 34, Norfolk-street, Strand, for an historical subject, the *Silver Isis Medal.*

26. To the same, for a portrait, a miniature, the *large Silver Medal.*

27. To Mrs. Matheson, 75, Margaret-street, Cavendish-square, for an historical subject, the *Silver Palette.*

28. To Miss E. Twining, 34, Norfolk-street, Strand, for a portrait, a miniature, the *Silver Palette.*

29. To Miss S. Cox, 22, Nottingham-street, for a portrait, a miniature, the *Silver Palette.*

30. To Miss J. S. Guy, 3, Bartlett's-place, for a landscape, the *Silver Palette.*

31. To Miss A. Hopkins, 83, Berwick-street, Soho, for a landscape, the *large Silver Medal.*

32. To Mr. Edwin Williams, 12, St. Albans-place, for a landscape, the *Silver Palette.*

33. To Miss L. J. Green, 27, Argyll-street, for a miniature composition, the *Silver Palette.*

ORIGINAL DRAWINGS IN CHALK, PENCIL, AND INDIAN INK.

34. To Mr. Ed. Williams, Ambroseden, for a drawing from the living figure, the *Silver Palette.*

COPIES IN CHALK, PENCIL, AND INDIAN INK.

35. To Mr. T. Barrett, 78, Mark-lane, for a landscape, the *Silver Isis Medal.*

36. To Miss E. Bartrum, 11, Upper Bedford-place, for a head in chalk, the *Silver Palette.*

37. To Miss Stacey, 8, Hart-street, Bloomsbury, for a head in chalk, the *Silver Palette.*

38. To Miss M. J. Lightfoot, 10, Ebury-street, Pimlico, for a head in chalk, the *Silver Palette.*

39. To Mr. M. Starling, 19, Weston-place, Pancras-road, for a landscape in pen and ink, the *Silver Isis Medal.*

40. To Miss S. H. Oakes, Mitcham, Surry, for a head in chalk, the *Silver Isis Medal.*

41. To Miss H. M. Lightfoot, 10, Ebury-street, Pimlico, for a head in chalk, the *Silver Palette.*

42. To Miss E. Guy, 3, Bartlett's-place, Holborn, for an historical subject in chalk, the *Silver Isis Medal.*

43. To the same, for a landscape in pencil, the *Silver Isis Medal.*

44. To Miss Mumford, Thames Ditton, for an historical subject in chalk, the *Silver Palette.*

45. To Miss M. Hartman, 48, York-street, Portman-square, for an historical subject, the *large Silver Medal.*

46. To Miss J. Robson, Doncaster, for a landscape in pen and ink, the *Silver Palette.*

47. To Miss C. F. Gray, 18, Burton-street, Burton-crescent, for a landscape in pencil, the *Silver Palette.*

48. To Mr. D. Pasmore, 6, Salisbury-court, Fleet-street, for an historical subject in pencil, the *Silver Palette.*

49. To the same, for a head in chalk, the *Silver Palette.*

50. To Mr. G. Brown, 198, Regent-street, for an historical subject in Indian ink, the *Silver Isis Medal*.

51. To Miss Leonora Burbank, Albany-road, Camberwell, for a head in chalk, the *Silver Isis Medal*.

DRAWINGS FROM STATUES AND BUSTS.

52. To Miss S. Cox, 22, Nottingham-street, for a drawing in chalk from a bust, the *large Silver Medal*.

53. To Miss Augusta Hamlyn, Plymouth, for a drawing in chalk from a bust, the *Silver Palette*.

54. To Miss Di. Laurance, 360, Oxford-street, for a drawing in chalk from a bust, the *Silver Isis Medal*.

55. To Mr. H. T. Wright, 52, Great Titchfield-street, for a drawing in outline from the antique, the *Silver Palette*.

56. To Mr. S. M. Smith, 49, Great Marlborough-street, for a finished drawing from the antique, the *Silver Isis Medal*.

57. To Mr. Edwin Dalton, 7, Aldgate, for a finished drawing from the antique, the *Silver Palette*.

58. To Mr. J. W. Solomon, 86, Piccadilly, for a finished drawing from the antique, the *large Silver Medal*.

59. To Mr. J. F. Denman, 32, Cannon-street-road, for a drawing in chalk from a bust, the *Silver Isis Medal*.

60. To Mr. B. R. Green, 27, Argyll-street, for a drawing in chalk from a bust, the *Silver Palette*.

61. To Mr. W. Gill, 16, Wilmot-street, Brunswick-square, for a drawing in chalk from the antique, the *Silver Palette*.

MODELS IN PLASTER.

(ORIGINAL.)

62. To Mr. Joseph Deare, 12, Great St. Helen's, Bishopsgate, for a bass-relief from the life, the *Silver Isis Medal*.

63. To Mr. Ed. Edwards, 4, Newcastle-place, Clerkenwell, for a bass-relief from the life, the *large Silver Medal*.

64. To the same, for a bust from the life, the *Silver Isis Medal*.

65. To Mr. E. G. Physick, 23, Spring-street, Montague-square, for a model of a group, the *large Silver Medal*.

(COPIES.)

66. To Mr. T. Butler, 91, Dean-street, for a model of a figure from the antique, the *large Silver Medal*.

67. To Mr. Frederic Tatham, 1, Queen-street, May-fair, for a model of a figure from the antique, the *Silver Palette*.

68. To Mr. Joseph Deare, 12, Great St. Helen's, Bishopsgate, for a model of a group from the antique, the *Silver Isis Medal*.

69. To Mr. J. Sargeant, 4, Burlington-place, Kent-road, for a model of a bust, the *large Silver Medal*.

ARCHITECTURE.

70. To Mr. R. G. Wetten, 19, Bruton-street, for a design for London Bridge, the *Gold Medallion*.

71. To Mr. Henry Roberts, Camberwell-terrace, for a design for London Bridge, the *large Silver Medal*.

72. To Mr. J. D. Paine, 39, High-street, Bloomsbury, for a design for London Bridge, the *large Silver Medal*.

73. To Mr. G. Parminter, Jun., 19, High-street, Blackfriars, for a perspective view of St. Paul's, Shadwell, the *large Silver Medal*.

74. To Mr. J. B. Watson, Surbiton-hill, Kingston, for an original design for houses, in Greek architecture, the *Gold Isis Medal*.

75. To Mr. G. T. Andrews, 29, Lower Brook-street, for an original design for houses, in Greek architecture, the *Silver Isis Medal*.

76. To Mr. T. Plowman, Oxford, for an original design for houses, in Greek architecture, the *large Silver Medal*.

77. To Mr. P. H. Desvignes, 15, Hunter-street, Brunswick-square, for a perspective view of Pancras New Church, the *Silver Isis Medal*.

78. To Mr. J. G. Welford, Jun., 27, South-street, Grosvenor-square, for a perspective view of a Corinthian capital, the *Silver Palette*.

79. To Mr. W. Morris, 26, St. Paul's Church-yard, for a perspective view of a Corinthian column, the *Silver Isis Medal.*

80. To Mr. Henry Roberts, Camberwell-terrace, for a perspective drawing of a Corinthian capital, the *large Silver Medal.*

DRAWINGS OF MACHINES.

81. To Mr. J. B. Watson, Surbiton-hill, Kingston, for a perspective drawing of a crane, the *Silver Isis Medal.*

82. To Mr. P. W. Barlow, Woolwich, for a perspective view of a transit theodolite, the *large Silver Medal.*

ENGRAVINGS.

83. To Mr. G. Presbury, 12, Denzell-street, for a finished historical engraving, the *large Silver Medal.*

84. To Mr. Ed. Radclyffe, Birmingham, for an etching of animals, the *Silver Isis Medal.*

85. To Mr. S. Clint, Rolls-buildings, for an original medal die of a head, the *large Silver Medal.*

86. To Mr. James Howe, Little Tufton-street, for an original whole-length miniature in wax, the *Silver Isis Medal.*

87. To Mr. Edm. Turrell, 46, Clarendon-street, for an improved menstruum for biting in on steel plate, the *large Gold Medal.*

88. To Mr. J. Straker, Jun., 11, Redcross-square, Cripplegate, for a new model of embossing on wood, the *Silver Isis Medal* and *Ten Guineas.*

IN MANUFACTURES.

1. To D. Maclean, Esq., 7, Basinghall-street, for cloth made of New South Wales wool, the *Gold Isis Medal.*

Rewards given for Bonnets made of British Grass, in imitation of Leghorn.

2. To Miss L. Hollowell, Neithrope, Banbury, *Fifteen Guineas.*
3. To Mrs. Morrice, Great Brickhill, Bucks, *Fifteen Guineas.*
4. To Priscilla Surry, Harpinden, Herts, *Fifteen Guineas.*
5. To Betty Webber, Clatworthy, Devon, *Ten Guineas.*
6. To Mrs. E. Mills, Northumberland-place, Bath, *Ten Guineas.*
7. To Mary Marshall, Bandon, Cork, the *Silver Ceres Medal.*
8. To the children of the school at Bandon, *Five Guineas.*
9. To Messrs. Jas. and A. Muir, Greenock, the *Silver Ceres Medal.*
10. To Mrs. Mears, Durley, Hants, the *Silver Ceres Medal.*
11. To Mrs. Venn, Hadleigh, Suffolk, the *Silver Ceres Medal.*
12. To Mrs. S. Pyman, Coombs, Stowmarket, the *Silver Ceres Medal.*
13. To Messrs. Cobbing and Co., Bury St. Edmunds, the *Silver Ceres Medal.*
14. To Mrs. E. Bloomfield, Bury St. Edmunds, *Five Guineas.*
15. To Mrs. M'Michael, Penrith, *Five Guineas.*
16. To Jane Hurst, Leckhampstead, *Two Guineas.*
17. To the children of the national school at Nunney, near Frome, *Two Guineas.*
18. To Miss M. E. Collins, Dublin, the *Silver Ceres Medal.*

19. To Mr. P. Caron, Spitalfields, for preventing the watering of plain silks, *Five Guineas.*

IN MECHANICS.

1. To Mr. F. Watt, for a screw-wrench, *Ten Guineas.*
2. To Mr. T. Eddy, 354, Oxford-street, for a screw-wrench, the *Silver Vulcan Medal.*
3. To Mr. G. Gladwell, 4, Lower Garden-street, Vauxhall, for an improved plane for carpenters, *Five Guineas.*
4. To Mr. G. Welsh, 12, Mount-street, Walworth-common, for an original screw, the *Silver Vulcan Medal* and *Ten Guineas.*
5. To Mr. J. Duce, Wolverhampton, for a quadruple lock for safe chests, &c. the *Silver Vulcan Medal* and *Ten Guineas.*
6. To Ed. Speer, Esq. 7, New Inn, for concentric chucks for turners, the *large Silver Medal.*
7. To Captain Bagnold, 7, High-row, Knightsbridge, for an improved culinary steam-boiler, the *Silver Vulcan Medal.*

8. To Mr. J. Aitkin, St. John-street, Clerkenwell, for a remontoire escapement, *Twenty Guineas.*
9. To Mr. J. Bothway, Devonport, Plymouth, Gunner in the Royal Navy, for an apparatus for raising invalids in bed, the *Silver Vulcan Medal.*
10. To Mr. J. Stirling, Glasgow, for a set of working drawings of a steam engine, *Twenty Guineas.*
11. To Mr. R. W. Franklin, 92, Tottenham Court-road, for an improved mode of feeding the boilers of high pressure steam engines, the *large Silver Medal* and *Fifteen Guineas.*
12. To T. Bewley, Esq. Montrath, Ireland, for an improved mode of heating manufactories, the *large Silver Medal.*
13. To Mr. F. Richman, 35, Great Pultney-street, for a method of raising a sunken floor, the *large Silver Medal.*
14. To Mr. A. Ainger, Everett-street, for his mode of supporting beams or other timbers, the ends of which have become decayed, the *large Gold Medal.*
15. To Mr. R. Soper, Royal Dock-yard, Devonport, for a pitch kettle and ladle for paying the seams of ships, *Ten Guineas.*
16. To Mr. W. P. Green, Lieut. R. N. for improvements in working ships' guns, the *large Silver Medal.*
17. To Mr. R. C. Clint, for his balanced masts, the *large Silver Medal* or *Twenty Guineas.*
18. To G. Burton, Esq. Capt. R. N. for his improved mode of securing an anchor, the *large Silver Medal.*
19. To Mr. W. J. T. Hood, Lieut. R. N. for his improved quadrant for naval use, the *Gold Vulcan Medal.*
20. To Mr. G. Smart, Pedlar's Acre, Lambeth, for an improved mode of supporting the top-masts of ships, the *Gold Vulcan Medal.*

IN COLONIES AND TRADE.

1. To M. Chazal, Isle of France, for silk the produce of the Isle of France, the *large Gold Medal.*
2. To Mr. T. Kent, for preparing and importing from New South Wales extract of Mimosa bark for the use of tanners, *Thirty Guineas.*
3. To J. M'Arthur, Esq. Sydney, New South Wales, for the importation of the greatest quantity of fine wool, the produce of his own flocks, the *large Gold Medal.*
4. To Hannibal M'Arthur, Esq. Sydney, New South Wales, for the importation of the next greatest quantity of fine wool, the produce of his own flocks, the *large Silver Medal.*

THE SPECIAL THANKS OF THE SOCIETY WERE ALSO VOTED

1. To Mr. W. Salisbury of Brompton, for his letter on the naturalization of the Phormium Tenax, or New Zealand flax, in the British islands.
2. To Mr. J. Ferguson of Newman-street—
3. To Mr. W. Lea, of King-street, Northampton-square—
4. To Mr. W. Palmer of Clifton-street, Finsbury-square—
5. To Mr. Joseph Fincher, Assistant-Secretary at the Royal Institution—for their respective communications of plans for the prevention of forgery.
6. To R. Wilmot Horton, Esq., V. P., Under-Secretary of State for the Colonies, for a collection of sundry articles the produce of New South Wales, or manufactured in that colony.
7. To Mr. Westcott of Oxford-street, for his magnetic guard for persons employed in dry-grinding.

TRANSACTIONS

OF

THE SOCIETY

DURING THE SESSION 1823-24.

PAPERS

IN

AGRICULTURE.

No. I.

RAISING OAKS.

The LARGE GOLD MEDAL, *the premium offered in the year* 1822, *was this session given to* PHILIP HURD, *Esq. of Kentish Town, for raising* 7570 OAKS. *The following communication on the subject has been received from the candidate.*

SIR, Kentish Town House, January, 1822.

As a young member of the Society of Arts, &c. I take the liberty to communicate to you that since the year 1817 I have raised, on the estate now in my occupation at the foot of Highgate-hill, seven thousand five hundred and seventy oaks, all which are now in a healthy and thriving state.

In the autumn of 1817 I collected under the trees on my own premises upwards of ten thousand remarkably fine acorns, which I sowed in drills in March 1818, covered two inches deep in the ground, and which were transplanted in March 1821, with some larch trees mixed amongst them. The ground being of a deep loam was trenched two feet deep, and the plants were set three feet apart from each other; and the ground hath been kept clean from time to time. Most of the plants have made shoots from eight inches to a foot long. Such of the plants as appear stinted in their growth I intend cutting down to within two inches of the ground, agreeably to a practice which prevails in many parts of Scotland with great success. The plants so cut down generally put forth two or three fine shoots, which should be looked over about the end of June, and the most promising shoot be left, and the others taken off, by which method they often become the finest trees. The plants are all carefully and effectually fenced off by hurdles, &c.

As the foregoing has taken place within the bills of mortality, I hope the communication will not be deemed unworthy of your notice.

In 1817 the acorns were very plentiful and fine; and having upwards of one hundred full grown oaks growing on my estate, and which appear to agree very well with the soil, I had an opportunity of selecting upwards of ten thousand of the finest acorns I ever saw.

The plants in question are intended, with others, to secure a succession of oak timber in this country.

I am, Sir,
&c. &c. &c.
P. Hurd, F.A.S. & F.H.S.

A. Aikin, Esq.
Secretary, &c. &c.

CERTIFICATE.

We hereby certify that Mr. Philip Hurd hath raised seven thousand five hundred and seventy young oaks, as described in his aforesaid letter, which are all now on the land in a healthy and thriving state.

PETER SHIELLS,
Gardener to the said Mr. Hurd.
THOMAS ASTON, Jun. F.H.S.
43, *Upper Guildford-street.*

No. II.

EMBANKING LAND FROM THE SEA.

The LARGE GOLD MEDAL, being the premium offered, was this session given to HENRY BLYTH, Esq. of Burnham, in Norfolk, for EMBANKING 253 ACRES OF LAND FROM THE SEA. The following communication on the subject has been received from the candidate.

SIR, Lynn, January 24, 1824.

I HAVE great pleasure in forwarding to you the accompanying documents relative to the embankment of the Burnham Deepdale salt-marsh; and in adding my testimony to the zeal displayed by Mr. Blyth in carrying forward a measure of great public utility, in a district where fresh marshes are much wanted, not only against the formidable obstacles presented by nature, but against the prejudices of his neighbours, who entertained groundless apprehensions in regard to the result.

Mr. Blyth's character is so well known as an agriculturist, that it is needless for me to do more than to recommend his claim to the favourable notice of the Society.

I am, Sir,
&c. &c. &c.
FRED. LANE.

A. Aikin, Esq.
Secretary, &c. &c.

SIR, Burnham, January 21, 1824.

I BEG leave to offer to the Society for the encouragement of Arts, &c. a claim for the premium offered by them for reclaiming land from the sea.

The marsh on which the embankment was made is situated in Burnham Deepdale, in the county of Norfolk, and contained three hundred and forty-eight acres, subject to the overflowing of the ordinary spring tides, sometimes to the depth of four or five feet, (and with a north-west gale of six feet), and intersected with numerous creeks; but, being covered with a short sward or turf, affording pasturage for sheep during the spring tides, but that only in the summer and autumn.

The embankment was begun in April 1822, and completed during the following winter: it is one mile and a half long,—its base seventy feet,—height ten feet,—outer slope, or face, five feet to one,—inner slope, or back, one and a half feet to one,—top five feet. The embankment includes a puddle wall, three feet thick, to within a foot of the top. There is a foreground of twenty feet between the foot of the bank and the excavation, and of thirteen feet between the back of the bank and a drain cut parallel with it to convey the fresh water to the sluice. The sluice is built of brick, on a platform of wood, with a tunnel fifty feet long and five feet diameter, with land and sea doors at the respective ends. The bank is all turfed over with four-inch flags, with the exception of the top which is gravelled. The flags were taken from the spare ground outside, which, from the irregularity of the boundary, could not be brought within the bank, which encloses two hundred and fifty-three acres within the drain.

A great increase of pasture was found last year. Part is now broken up, and prepared for being sown with oats; part has been sown down with grass seeds, which are growing well; the remaining part will be brought to tillage as quickly as circumstances will admit.

The above embankment was executed under the inspection of Mr. Telford, civil engineer. Some land was also enclosed in the adjoining parish, under similar circumstances, by the Earl of Orford.

The highest tides on this coast are with a north-west wind. The gale on the 31st October had no effect on the bank, which bids fair to stand against any washing of the tides.

Enclosed are certificates from two neighbouring gentlemen, well acquainted with the ground in question.

I am, Sir,
&c. &c. &c.
HENRY BLYTH.

A. Aikin, Esq.
Secretary, &c. &c.

His Royal Highness the Duke of Sussex was pleased to inspect the work, and express his gratification on seeing it during its construction.

CERTIFICATES.

January 22, 1824.

I DO hereby certify, that Mr. Blyth of Burnham did reclaim from the sea, and effectually enclose from the overflowing of the tides, by a most substantial embankment, the largest part of the salt marshes in the parish of Burnham Deepdale, amounting by admeasurement to two hundred and fifty-three acres.

WILLIAM BOLTON,
Rector of Brancaster.

Burnham, Norfolk, January 22, 1824.

THIS is to certify, that Mr. Blyth of Burnham did, during the year 1822, effectually enclose and secure from the overflowing of the tides the greatest part of the salt marsh within the parish of Burnham Deepdale, in the said county of Norfolk, amounting by admeasurement to two hundred and fifty-three acres.

JOHN GLASSE,
Rector of Burnham.

No. III.

BRITISH OPIUM.

The sum of **THIRTY GUINEAS**, *being the premium offered in the year 1822, was this session given to Messrs.* **COWLEY** *and* **STAINES**, *of Winslow, Bucks, for cultivating twelve acres of Poppies, and obtaining therefrom 196lbs. of* **OPIUM**. *The following communications have been received from the candidates on the subject.*

SIR,

THE Society of Arts, &c. having, by the offer, in 1822-23, of the premium No. 29, extended their encouragement to the cultivation of the *papaver somniferum* for opium in 1823, we respectfully offer ourselves as candidates for that premium, having in that year collected one hundred and ninety-six pounds of opium from poppies growing on twelve acres, one rod, and thirteen poles of land.

The enclosed specimen will exemplify the quality of the opium, which appears to be precisely similar to that which we have obtained in the last few years.

The general system of cultivation pursued by us last year was nearly the same as described in the 40th vol. of the Society's Transactions. The intervals between the rows were diminished from twenty-one to twenty inches; the seed was got in between the 14th of February and the 6th of March; the crop was very abundant, and the heads remarkably large. The interval diminished an inch was found to afford sufficient room for the people, but not to such an extent as to encourage any further reduction.

One of the greatest obstacles to the cultivation of opium is obviously the rainy weather which generally prevails during the season for its collection. In the last season we had scarcely a day without frequent showers, which of course carried off a considerable quantity of opium. As a preventative from some of the ill effects of the weather, we derived much advantage from an alteration in the position of the blades of the scarificator from the perpendicular to an angle of forty-five degrees, the object of which was to prevent the rain from lodging upon or entering the incision. This intention it was found to fulfil, by forming the upper side of each incision into a sort of flap for the protection of the lower side.

We also perceived that it was a considerable improvement to operate upon alternate rows: we mean, for instance, to scarify and scrape the first, third, fifth, &c. rows throughout the field, and then to proceed with the second, fourth, sixth, &c. This was found completely to obviate the wasteful consequences of the rows being wiped by the clothes of the collectors.

For the encouragement of those who may be deterred from cultivating opium by a want of resident labourers, we beg leave to state, that we last year employed, by way of experiment, six migrating Irish, all of whom were docile, peaceable, and industrious: they were paid one shilling per day, to work eleven hours. We also solicit permission to add, by way of a general guide to such as may wish to know how far the cultivation of the poppy can be extended at any particular place, that our population consists of about eleven hundred persons, of whom the female poor are all lace-makers; of this number we can bring into the field about a sufficient number to collect opium from fifteen acres of land; if we cultivate much more than that quantity we must do it by the Irish, great numbers of whom are every year seeking employment during the opium season. The greatest number we employed at one time was one hundred and sixty-five. The collection was begun July 21st, and finished August 7th.

The following is an account of the expense of *collecting* the opium:

	£	*s.*	*d.*
Paid to the labourers	76	5	8½
Beer consumed by ditto, 6½ hogsheads . .	17	11	0
	£93	16	8½

From the above account it will appear that the expense of collecting amounted to 9*s*. 6¾*d*. per lb.

The character of the English opium continues to be generally approved by the medical profession: it now sells at two shillings per lb. *above* the best foreign; and we believe that nothing but the carelessness of cultivators is likely to bring it into disrepute. One of the most positive directions given to those employed in collecting opium, should be, to avoid the fall of petals, stamina, &c. into the receivers, and to take care if an implement falls to the ground, that it be properly cleaned from grit, &c., a small quantity of which would seriously injure the sample. Whilst every precaution is scrupulously observed for insuring the purity of the article, we have no doubt the profession will cheerfully continue to pay a corresponding price.

The land on which the above-mentioned crop was sown, was in the following state with respect to succeeding crops, viz.:

A.	R.	P.	
4	3	22	had borne in four successive years crops of poppies, with stone turnips after each, fed off with sheep.
3	3	10	had borne one crop of poppies, succeeded by stone turnips fed off with sheep.
0	2	31	wheat stubble, well manured.
2	3	30	clover ley, well manured; had been twice mown.
12	1	13	

From the apparent exhaustion of the soil, and the subsequent goodness of the crop on the clover ley, we are of opinion that poppies succeed better after clover than after any other crop.

The labourers were paid at the following rates per day: —men, 1*s.*; women, 10*d.*; children above ten years of age, 6*d.* to 9*d.*; ditto under ditto, 3*d.* to 6*d.* The men to work eleven hours per day, the women and children ten, all being allowed beer twice a day, which was found to contribute more to their satisfaction than higher wages used to do without that allowance.

We are, Sir,
&c. &c. &c.
JOHN COWLEY,
WM. STAINES.

A. Aikin, Esq.
Secretary, &c. &c.

P.S. We have enclosed a sample of the opium, and an improved scarificator, as before named, also a worn out one of the same construction.

CERTIFICATES.

Sir, Winslow, January 31, 1824.

I hereby certify, that, to my knowledge, Messrs. Cowley and Staines collected, in the year 1823, one hundred and ninety-six pounds of opium from poppies of their growth: it was weighed in my presence, and was of the same quality as the enclosed sample.

Reuben Stuchbery.

A. Aikin, Esq.
Secretary, &c. &c.

2, Newman's-row, Lincoln's Inn-fields,
Sir, February 3, 1824.

I beg leave to state, for the information of the Society of Arts, that I have continued the use of British opium during the last year, and up to the present time; and with precisely the same results as mentioned in the certificates I have had the honour of forwarding to the Society the two preceding years.

I am, Sir,
&c. &c. &c.
Thos. Clarke,
Surgeon, &c.

A. Aikin, Esq.
Secretary, &c. &c.

Sir, Winslow, February 25, 1824.

We beg leave to transmit to you the following accounts and observations for the further elucidation of the cultivation of poppies, in obedience to the wishes of the Society, as expressed in your communication of the 13th instant.

A prominent question in your letter demands the nature and value of the soil on which our opium has been produced. The soil is somewhat varied, but consists in all parts of a good loam, from twelve to six inches deep, lying mostly upon sand, but in some places upon clay.

A porous subsoil appears to us as a circumstance of the first rate importance, for where it consists of clay our crops have invariably been inferior to those which have grown on such parts as were situated upon the sand, although assisted with more manure; and this too, when, owing to frost, no injury could be attributable to the treading of the sheep when feeding off the turnips. So strong, indeed, is our conviction of the ill effects of an impervious subsoil, that we have no hesitation in saying, that however good the soil, or however dry it may appear, if it be situated immediately above clay, no profit can be extracted from it by the growth of poppies, so frequent will be the partial (or total) failure of the crop.

Two respectable farmers in this neighbourhood, in consequence of our recommendation, grew upwards of an acre of poppies each, and extracted opium from them exactly after our method. The crop was far from good with either, and late with both, owing, apparently, to late sowing, viz. in the beginning of April; the general appearance of the plants showing that the soil, in both cases, was adapted to their flourishing growth. We beg leave to introduce the following remarks upon these soils, as being examples of the growth of poppies on two distinct species of land, each different from our own.

The earth in one case consisted of a free-working grey loam, containing a large proportion of calcareous matter, and lying, in depth about ten or twelve inches, immediately upon a rock of limestone. This land is perfectly dry, owing, probably, to the existence of a sufficient number of fissures in the rock to carry off the rain; for, as is well known, a stratum of limestone is often as retentive of water as one of clay. This field is considered extremely fertile of wheat, turnips, barley, and peas.

In the other instance the soil lies upon gravel, is of a black colour, and contains a great proportion of vegetable mould,—a kind of earth known to agriculturists in this district by the term hen-mould, and, we believe, more extensively by the name of rotten loam. The following habits are common to this variety of soils: they work freely, do not bind in dry weather, bear a large quantity of straw without a proportionate measure of corn, they are spontaneously productive of lactiferous plants, such as *sonchus asper, sonchus arvensis, leontodon taraxacum, picris echioides*, &c. In the instance of which we are now speaking, the poppies were sown in part of a bean-field; and the cultivator is much pleased to observe that the crop of wheat which is now succeeding both is superior, as respects cleanness and vigour, where the poppies grew, to that which follows the beans, a circumstance which has convinced him that the poppy is, comparatively, by no means an exhausting crop. We may observe in this place, that each of these experimenters is about to sow again for this season.

The rent of the land we occupy, as seen in the subjoined table, you will probably accept as an answer to your inquiries as to its value; although we must beg leave to observe, that the rent of Western Field is generally considered to be double its annual value. The scarcity of sandy subsoil in this parish, which is by no means an arable one, having hitherto been our chief inducement to occupy it.

We should have remarked, that a tolerably correct idea of the fitness of any particular soil for the growth of poppies may generally be formed by observing the shape in which it produces the capsules of the poppies. On suitable land these generally assume the oblate spheroid form, while in unfavourable situations they constantly degenerate into an oval shape, an accident which may usually be traced to disease of the root; and which invariably diminishes the product of opium, and, in a lesser degree, that of seed also.

We annex the two following tables in answer to your inquiries for the expenses of the cultivation. They are extracted from our books with the greatest care: if any slight inaccuracy exist it will be in the details and not in the total, and will be owing to the great difficulty of perfectly separating the expenses of operations in many cases concurrent.

We are, Sir,
&c. &c. &c.
Cowley & Staines.

A. Aikin, Esq.
Secretary, &c.

Table of the expenses of cultivating 12*a.* 1*r.* 22*p. of white poppies, and extracting opium, seed, and extract therefrom:—*

	£	s.	d.
Rent of Western Field, 4*a.* 3*r.* 22*p.*	20	0	0
Twelve poor's-rates for ditto, 8*s.* 6*d.* each .	5	2	0
Rent of part of Shipton Field, 7*a.* 2*r.* 0*p.* . .	18	15	0
Twelve poor's-rates for ditto, 7*s.* 6*d.* each .	4	10	0
Bought manure	7	0	0
Carting of ditto, and of poppy-straw dung .	11	10	0
Carried forward .	£66	17	0

	£	s.	d.
Brought forward	66	17	0
Ploughing for turnips	7	10	0
Harrowing for ditto	1	0	0
Turnip seed	1	2	0
Sowing ditto	0	3	6
Hoeing turnips twice, and partly three times	9	0	0
Ploughing turnip land and clover ley for poppies	9	10	0
Raking land for poppies	3	2	0
Drilling poppy seed, and couching	2	8	0
Dutch hoeing ditto	3	15	3
Setting out ditto, and hand-weeding	13	4	0
Hoeing ditto twice, and weeding	7	4	0
Collecting opium, evaporating ditto, and beer	103	5	0
Pulling poppies with the root	6	5	0
Carting ditto to Home-close-green, and shocking them there to dry	6	7	0
Picking off the heads, and building the straw into a rick	5	18	0
Thrashing machine, one day	1	1	0
Six horses for ditto, one day	1	0	0
Eight men and six boys for ditto	0	19	0
Expense of winnowing seed	0	7	6
Paid for labour and coals employed in making extract	8	10	0
Carriage of seed, opium, and extract to London	6	3	0
Proportion of charges for making and repairing implements, &c.	9	10	6
	£274	1	9

Table of the produce of the above land, in opium, seed, extract, and turnips.

	£	s.	d.
Opium 196 lbs., at 1*l.* 10*s.* 6*d.* per lb.	298	18	0
Seed 25 cwt. 1 qr. 22 lb., at 12*s.* per cwt.	15	5	3
Ditto unsold, about 5 cwt., worth	3	0	0
Extract 381 lb., at 1*s.* 6*d.*	28	11	6
Turnips 10 acres, at 2*l.* 10*s.* per acre	25	0	0
	£370	14	9

No. IV.

NATURALIZATION OF NEW ZEALAND FLAX.

The Thanks of the Society were presented to Mr. Wm. Salisbury of Brompton, for the following communication relative to naturalizing in the British Islands the Phormium Tenax, or New Zealand Flax.

Sir, Brompton, Middlesex, April 6, 1824.

During my late researches into the rural economy of the southern parts of Ireland, I discovered that the *phormium tenax*, or New Zealand flax plant, was growing there in the fullest luxuriance; and that it appeared to have become, in a great degree, naturalized to the climate and soil of that country.

As the qualities of New Zealand flax, as applied to naval purposes, &c. have of late been so much the subject of inquiry and conversation, particularly since the return of

Mr. Commissioner Bigge from New South Wales, I shall refrain troubling you with any detail on that head further than to notice, that having a desire to gratify some Irish gentlemen, I have had some of the flax scutched, (specimens of which I have by me), which, in point of produce, proved most fully the account I gave of the experiment I made at the request of Mr. Bigge, on which that gentleman's report, as printed by order of the House of Commons the 13th of March last, is founded. On this head I shall therefore beg leave to refer you to the enclosed copy of that account, as from all I have been enabled to learn, the same advantages that the propagation and culture of the New Zealand flax offer to the settlers in the colony of Sydney may be certainly reaped by the proprietors of land in the province of Munster at least.

As my object in going to that part of Ireland was to discover what additional means might be applied so as to extend the domestic employment of the poor; and with the hope that the cultivation of the *phormium* might become in a great degree subservient thereto, I was led to follow up my first discovery by inquiries into the habit of growth of that plant, and from the most respectable authority I am empowered to state,—

1st, That it has been cultivated as an ornamental plant, in the open ground, in "the counties of Waterford, Cork, "Limerick, Louth, Dublin, and Wicklow; that it is per"fectly hardy, inasmuch as it has grown for the last thirty "years on one estate successively, during which period it "was noticed to have been once or twice only triflingly "affected by frost, and that only in the tops of the leaves.

2d, "That it is capable of being propagated by offsets "from the roots, in a ratio sufficient to prove that it may

" be brought into cultivation on a large scale, if efficient " measures are taken for that purpose."

The foregoing accounts, so very favourable to the probability of the *phormium* becoming in time an object of general cultivation with the proprietors of land in the south of Ireland, were first the result of my own deliberate observation, and have been since confirmed by the testimony of letters from the Right Honourable Lord Oriel, Mr. John Underwood, the curator of the botanic garden at Glasnevin, who has there resided twenty-eight years, and others. And since my return I am also informed that the plant grows equally well at the seat of Lord Cawdor in Pembrokeshire, and also at several places near to Exeter; it may therefore become also a valuable acquisition to many parts of the south-west of England.

Although the results of my former experiments were calculated principally from the dried material, as imported from New Zealand by Mr. Bigge, I nevertheless did procure some green leaves from the green-house, and on the produce of which I drew my conclusions as to the acreable produce. I have, however, had in Ireland a larger qantity at command, and, my experiments being more perfect, and on a larger scale, I am enabled thereby to state the following facts in addition.

From the growth of the plants, in the general *arrangements of hardy plants*, at Glasnevin, it appears that plants of three years old will, on an average, yield thirty-six leaves, besides a very considerable increase of offsets, which leaves being cut down, at the time of clearing the quarters in the autumn, are found to spring up again the following summer.

Six leaves have produced me one ounce of fibres, when scutched perfectly clean and dry: at which rate an acre of land planted with this crop, at three feet distant plant from plant, will yield rather more than sixteen hundred weight per acre, which is a very great produce compared with that of either flax or hemp.

New Zealand flax is scutched with little labour or trouble, and may be performed by persons in common. The leaves should be cut when full grown, and macerated for a few days in stagnant water, and then passed under a roller machine properly weighted; by this process the fibres become separated, and if washed in a running stream they will instantly become white, as is the specimen I herewith send that has been thus treated. When the fibres are thus scutched clean and dry any kind of friction will cause them to divide into any degree of fineness in the harle, so far even as to cottonize, whereby it is fitted for all the purposes to which hemp or flax is adapted.

On the supposition that this may be considered by the Society as an object of some importance to this country, and worthy of its encouragement, I have taken the liberty of again intruding on their time; and if any further information that I can afford should be deemed necessary, I shall be most ready to afford it to the best of my ability.

I am, Sir,
&c. &c. &c.
W. SALISBURY.

A. Aikin, Esq.
Secretary, &c. &c.

EXTRACT of a letter from the Right Honourable Lord Oriel, dated February 17 last:—"I can aver that the "*phormium* is sufficiently hardy for our climate, it having

" thriven with me for thirty years and upwards. It is also " about in many other places, as Cork, Waterford, Lime- " rick, &c. where the leaves grow five, six, and even eight " feet high."

I should also make an extract from Mr. Underwood's account, but I have written to that gentleman for some other particulars, which shall be given when I obtain his answer.

The following is an extract from Mr. Underwood's letter, alluded to in Mr. Salisbury's postscript.

" The *phormium tenax* I brought to Ireland in the year " 1798: it was planted in the classes, and the roots never " injured, since 1800. In the year 1819, I put a plant in " the herbaceous quarter; and in the year 1823, from that " plant I took twenty-two plants, and left a good plant " behind. It increases much in the same manner as the " *sisyrinchium striatum*; but I do not think that the plant " should be parted till four years old. And in order to " have produce and profit, I should separate but one half " of the plant at a time, and the month of May I consider " the proper time to do it."

PAPERS IN CHEMISTRY.

No. I.

APPARATUS FOR CLEARING BEER.

The Large Silver Medal *was this session given to Mr. R. W.* Dickinson, *of the Albany Brewery, Kent-road, on an* Apparatus for clearing Beer *while in a state of fermentation. A model of the apparatus is placed in the Society's repository.*

The brightness of malt-liquor depends much on the accuracy with which the yeast produced by fermentation is separated; and the usual method of effecting this is the following.

The wort, after being duly boiled with the proper quantity of hops, is transferred into coolers, and, when its temperature has thereby been sufficiently lowered, it is removed to a large vessel called the gyle-tun, either open or fitted with a moveable cover. Here, after being mixed with yeast, it undergoes the first fermentation. The half-fermented liquor is then put into barrels lying on their sides, with the bung-hole uppermost, out of which the yeast is continually discharging itself, till the fermentation has ceased, or nearly so. During this time the barrels are examined once, twice, or oftener, in the day, and are filled up with fresh liquor in proportion as the yeast works off, so that the barrels shall be always full, in order that the yeast, as soon as it rises to the surface of the liquor, shall flow off entirely.

The object of Mr. Dickinson has been to conduct the whole of the fermentation in the barrel in which the beer is stored, and at the same time to provide for the escape of the yeast without the constant attention and expense of filling up as commonly practised.

For this purpose he places the barrels upright, and, having filled them with the wort previously boiled and cooled and mixed with the proper quantity of yeast, adapts to each barrel the following apparatus.

It consists of a tub *c c*, fig. 1, plate I., about the size of a peck measure, with a wooden cover *e e*, and having a vertical open pipe of pewter *b*, passing through the bottom: this pipe rises nearly to the top of the tub, and almost as soon as it has passed through the bottom expands into a broad flat margin, in order that it may be placed securely over the bung-hole of the barrel *a a*, with paper packing if required. Into the tub is put liquor of the same kind as that with which the barrel is filled, except that it is not previously mixed with yeast: the quantity of the liquor (about one-twelfth) is such as will be rather more than sufficient to supply the loss in the barrel in consequence of the fermentation. As soon as this process begins, the yeast, rising to the surface of the liquor in the barrel, passes through the bung-hole into the pewter pipe, and flows out of the upper end of it into the tub, the lighter particles, in the state of froth, floating on the surface of the liquor, and the heavier ones subsiding to the bottom. The vacuity occasioned by the separation of the yeast is continually supplied from the clear liquor in the tub, which flows in through the lateral hole *d*, in the vertical pipe.

It is the opinion of Mr. Dickinson, that by the adoption of the above described apparatus he saves about one and a half per cent. in quantity, and that the quality of the liquor is also considerably improved, besides avoiding the use of the gyle-tun, and the expense and loss of transferring the liquor therefrom to the barrels, and the loss of liquor in filling up according to the usual mode.

No. II.

IMPROVED SAFETY-CHAMBER TO THE OXY-HYDROGEN BLOW-PIPE.

The L*ARGE* S*ILVER* M*EDAL was this session presented to Mr.* H*ENRY* W*ILKINSON, of Ludgate-hill, for his improved* S*AFETY-CHAMBER TO THE OXY-HYDROGEN* B*LOW-PIPE. The following communication has been received from Mr. Wilkinson on the subject, and a model of the apparatus has been placed in the Society's repository.*

SIR, Ludgate-hill, February 11, 1824.

IN consequence of an explosion which took place last November, while volatilizing platinum with Mr. Gurney's oxy-hydrogen blow-pipe, I was induced to try some experiments, in order to render that instrument, if possible, more secure. (It is but justice here to observe that at the time of the explosion I was using a much larger and longer jet than any of those sold with the blow-pipe, and differently situated.) If the Society should consider the result I have obtained worth notice I shall be happy to prove the correctness of it by experiment and testimony.

The construction of Mr. Gurney's safety-tube is known to the Society; the chambers in which not being able, under certain circumstances, to arrest the retrograde motion of the flame, I thought it probable that the interposition of any bad conductor of caloric might effectually prevent its return: how far I have succeeded may be judged by the following experiments made with the same jet, all other circumstances of position and dimensions being correctly alike.

Having first chosen such a jet and arrangement of parts as would *always* explode with Mr. Gurney's safety-tube on diminishing the pressure, and would *frequently* so at the moment of ignition, I removed that and substituted another safety-tube entirely filled with wire-gauze; I still, however, found the flame return, driving out the cork every time, as in the preceding experiment.

I then tried a third tube, into which I had introduced, between the layers of wire-gauze and in the centre, some asbestus, previously beaten with a mallet and pulled out, so as to resemble floss silk. With this I could never succeed in causing an explosion to take place, although the flame of a wax taper was kept close to the orifice, and the pressure was diminished as gradually as possible; nor did it explode even when the orifice of the jet was enlarged. These experiments have been repeated by myself, and by a friend, a great number of times, with the same result. I am not aware that asbestus has ever been proposed or employed before for this purpose. The advantage of using this substance is evident, as the fibres cross each other in every possible direction, thus forming a filter for the gases to pass through much finer than any wire-gauze, and by its bad conducting quality it prevents those layers of wire-gauze which are behind it from being heated when an explosion takes place in the cavity of the jet.

The cylinder *f f*, fig. 2, plate I., is of brass, about three quarters of an inch long and the same diameter internally, (the figure represents it of the real size), and is filled in the following order, beginning at the end into which the jet *j*, screws.

The wire-gauze being cut to fit the cylinder correctly, each disc is introduced separately, having a small quantity of glazier's putty round the edge, and is pressed in with a piece of wood turned to fit the cylinder. After the first ten layers of wire-gauze *g*, have been introduced, a layer of asbestus *h*, is inserted one-eighth of an inch thick, equally laid and not pressed in too hard, then come ten more layers of wire-gauze *g*, another layer of asbestus *h*, and, lastly, twenty discs of wire gauze *g*, the two ends of the cylinders being concave, in order to afford as large an area as possible for the passage of the gas from the entrance pipe *i*, to the jet. As the object of this arrangement is to keep the last series of wire-gauze cool by the interposition of bad conductors of caloric, it appears probable that the safety would be rendered theoretically more perfect if the cylinder itself were a bad conductor, such as earthenware having brass caps cemented on the ends; or platinum, if metal were made use of, on account of its low conducting power. A brass cylinder, however, appears to be perfectly safe for every purpose, as I have never been able to cause an explosion to take place, although I have allowed the flame to retrograde, by gradually diminishing the pressure from 60 to 100 times successively, while using very long jets of one-eighth of an inch diameter at the aperture and much larger within. The wire-gauze should not be finer than from 3600 to 4900 apertures to the square inch, as it is liable to be fused by the return of the flame. I found that when I used wire-gauze with 8100 apertures it was destroyed in a very short time.

The model which accompanies this letter is made of glass, in order to show the internal arrangement.

I am, Sir,
&c. &c. &c.
HENRY WILKINSON.

A. Aikin, Esq.
Secretary, &c. &c.

No. III.

STOP-COCK FOR TRANSFERRING CORROSIVE GASES.

The SILVER VULCAN MEDAL was this Session presented to Mr. T. GRIFFITHS, Church-street, Kensington, for an improved STOP-COCK FOR CHEMICAL PURPOSES, &c. A model of his invention has been placed in the Society's repository.

THE common brass stop-cocks, if they have been employed for confining acid or other gases, especially when under pressure, are soon corroded throughout their whole interior extent, so that the plug or key becomes immoveable, and the bore filled up with a salt of copper, the consequent result of chemical action upon the metal of the instrument. A stop-cock made entirely of glass has also many disadvantages: its size and clumsiness of form, together with the difficulty of uniting it securely to other apparatus, are inconveniences often felt by the experimentalist.

To obviate them, and to offer a method in which stop-cocks of the common form are united with security against the attacks of active chemical agents, is the object of the present communication.

In accurate experiments on the absorption of gases by solid or other bodies, the advantage of having an apparatus not liable to be acted upon by the substances under examination will be readily acknowledged.

Platina is the material best adapted for this purpose, if its high price did not in most cases prohibit its use; most, or, perhaps, all its advantages may however be obtained in the method about to be described, and at a comparatively moderate expense.

The invention consists in making a stop-cock of the usual form, but of rather smaller dimensions, and selecting a piece of platina wire of sufficient thickness to allow a hole being drilled through its axis; this operation forms a thin tube of platina, which is afterwards accurately fitted into the bore of the brass stop-cock, leaving about one-sixteenth of an inch projecting at each end, which is to be opened and extended so as to cover each extremity with a plate of platina. The brass plug or key has a platina tube secured as above described, with the addition of two small discs of platina, placed at right angles to the gas-way or bore; these, together with the platina tube and brass parts of the instrument, are ground down perfectly air tight.

It will be obvious from this explanation, and upon reference to the engraving, that whether the stop-cock be open or closed, platina is opposed to the action of the gas or other agent. In the one case it protects the gas-way and ends of the instrument, in the other the small disc of platina prevents corrosion of the plug.

If it were desired to confer security to a moderate extent upon a stop-cock as usually employed, this may be easily effected by taking a glass tube, cutting it to the required length, cementing one portion into the plug, and the other into each end of the bore; if this be carefully done, so as to avoid any fragments of glass falling into the ground parts, it will be found very effectual in preventing corrosion, the gas-way always remaining clear.

While collecting gases in a mercurial gasometer a large body of gas has to pass through the aperture of a stop-cock, which at the same time it rapidly corrodes. If a stop-cock lined with glass be employed in this experiment it will be found to possess many advantages over that in common use, with little additional trouble or expense.

To prove how accurately a glass tube may be fitted into the brass with cement, several instruments constructed in the above manner have had the tubes filled up with nitric acid without any solution of metal taking place.

It should however be remarked that the protection of the instrument is withdrawn when closed, but this is of no great consequence in common experiments. If it is an object to have it protected, in an equal degree, when open or shut, the disc of platina formerly described may be resorted to.

Reference to the engraving of Mr. T. Griffiths's improved stop-cock for chemical purposes.

Plate III., fig. 4, is a longitudinal section of a stop-cock, represented as open.

The cock A A, is made in the usual manner, but with an additional platina tube *a a*, passing through it, and over its ends *b b*; the plug B has also a similar piece of platina tube *c*, passed through and fixed within it: there is also a disc of platina *d*, fig. 5, fixed on two opposite sides of the plug B, at right angles to the tube *c*, which resists the action of the gas (when shut), that may be contained in any vessel to which it is attached.

Fig. 5 is an external view of the plug B (in the same position as in fig. 4), showing one of the discs *d*, of platina.

Fig. 6 is a view of the opposite side of the plug, showing the end of the platina tube *c*.

No. IV.

PLAN FOR CONSUMING THE SMOKE OF STEAM-BOILERS, &c.

The LARGE SILVER MEDAL *of the Society was this session presented to Mr. G.* CHAPMAN *of Whitby, for his* METHOD OF CONSUMING THE SMOKE OF STEAM-BOILER FURNACES, &c. *The following communication on the subject has been received from the candidate.*

SIR, Whitby, February 4, 1824.

I BEG leave to offer myself as a candidate for the premium offered by the Society for the encouragement of Arts, Manufactures, and Commerce, entitled "a more effectual "consumption of smoke in steam engines, breweries, &c."

It is well known to all that are conversant on the subject, that it is necessary to admit a proportion of pure atmospheric air, to unite with the smoke after it is generated in the furnace, in order to supply the oxygen gas, without which it will not inflame. It is likewise known that any air admitted into the body of the furnace, if it does not go through the burning fuel, has a great tendency to cool the bottom of the boiler, and retard the generation of steam. To obviate this, it is the general practice, in the construction of those furnaces which consume the smoke, to admit the air partly at the ash-pit, and partly up through the fire-bridge. I offer for the consideration of the Society an improved plan, which I have adopted, and which has answered beyond my utmost expectations. It is as follows:

To heat the air before its admission into the furnace. This I do by casting the grate bars hollow from end to end, so that they form a series of parallel tubes, which open into two boxes, one placed in front, and the other behind the grate. In the front box, directly underneath the fire-door, I make a register to open and shut, to any extent, at pleasure. The other end I connect with the brick-work directly under the fire-bridge, which fire-bridge I make *double*, with a small interval between, say one inch; the interval to go across the furnace from side to side, and rather to incline forward, or towards the fire-door, so as to meet and reverberate the smoke on to the ignited fuel in the grate, which causes it to inflame and become a sheet of bright fire under the bottom of the boiler.

From what I have said you will perceive that if the front register is open, or partially so, there will be a great draught of air through it, along the interior of the grate bars, thence into the flue of the fire-bridge, and out of the orifice at top, which air will be heated in its passage through the bars, before it comes in contact with the smoke, when it will give out its oxygen, and cause it to inflame.

Such was my view of this part of the subject in theory, and I have found it to succeed in practice, in a small engine of my own. But a further improvement was necessary to make it quite perfect. There are few people who are aware of the extent of the mischief arising from the old method of charging a grate by the front door. Now, in my engine, (which is only two horse power), I calculated that every time the fire-door was opened to stir the fire and replenish the fuel, there could not be less than from forty-five to fifty cubic feet of cold atmospherical air admitted into the furnace, which so cooled the heated gases, &c. that, however complete the plan was in other respects, the smoke could not possibly inflame, from being so cooled, till a considerable time after the fire-door was shut.

To obviate this I have adopted a cast-iron hopper above the fire-door, with a type at the bottom that has two pivots at one side and opens at the other; one pivot goes through the end of the hopper and has a counter lever to keep the type shut when a sufficient quantity of coal for a charge is on it. The top of the hopper is covered with a lid which I shut down during the time of firing, then, by lifting the lever which opens the type inside, the coals slide down on to the fore end of the grate bars, which is only the work of a moment. It is evident that no quantity of cold air can thus get into the furnace; in fact, it is not possible for any person that does not see the operation of firing to know when fresh fuel is added by looking at the top of the chimney. The smoke that issues is never more than a light grey, just perceptible, but in a general way is not seen at all.

The coals last admitted, after lying a short time at the front of the more ignited fuel, become partially coked, and just before I admit a fresh supply, I push the last charge further along the grate, by a tool made for the purpose, which remains constantly in the furnace. It consists of a plate of iron about four inches broad; its length goes across the grate with a round bar of iron rivetted into its centre, at right angles, to form a handle, which comes through a hole made in the bottom of the fire-door, and is long enough for a man to use with both hands, so that he can either push from, or pull towards him, to manage the fire within, without opening the fire-door, except when the grate wants cleaning, &c. &c. For better knowing when the fire wants stirring, or replenishing, I have a hole, about an inch in diameter, in the fire-door, to look through, covered by a piece of iron which hangs by a rivet above.

After I have used the above instrument I pull it up close to the fire-door, where it remains till it is again wanted; and the coals, when let into the fire, fall down beyond it.

The above-written account constitutes the whole of my improvements so far as is required by the Society, but not the whole of the advantages gained by my invention. For instance, the durability of the grate-bars by the admission of air through them. I may add, that I examined my own yesterday, and I do not find them any worse, although they have been in use since the beginning of October last. In conclusion, I beg leave to refer you to the accompanying certificates by gentlemen who have had an opportunity of personally viewing my improvement, and who, I flatter myself, are all people of the first respectability.

I am, Sir,

&c. &c. &c.

G. Chapman.

A. Aikin, Esq.
Secretary, &c. &c.

N. B. I am perfectly aware that there are many plans of feeding furnaces by means of hoppers, yet I trust you will find my plan somewhat different; it is at least to what have fallen under my notice.

Reference to the figures of Mr. Chapman's mode of consuming the smoke of steam-boilers.—Plate II.

Fig. 1, An elevation.

Fig. 2, A section.

(The same letters refer to the same parts in both figures.)

a The boiler.

b The fire-place.

c The feeding-hopper, with its cover *d*, and its type, or turning bottom, with its lever and counterpoise *e*, by means of which the coals are delivered into the fire-place.

f A rake, by means of which the half-burnt coals are pushed forwards previously to letting in a fresh charge.

g A slit below the furnace-door, through which the shaft of the rake passes.

h An eye-hole in the furnace-door, through which the state of the fire is seen.

i i An air-tight box into the back of which the bars open, and in front of which is a register for the admission of air.

k One of the hollow bars, the whole of which are shown in fig. 3, as they open into the box *i*, fig. 1.

l A flue in the fire-bridge, through which the air, having passed first into the box *i*, and thence through the hollow bars *k*, passes into the furnace and consumes the smoke.

CERTIFICATES.

Whitby, January 30, 1824.

THIS is to certify that we, the undersigned, when first we knew that George Chapman was going to erect his steam-engine, &c. so near our houses, being from the furthest only forty yards, and from the nearest thirty yards, the engine chimney right in front of the door, were very much afraid, and apprehended a nuisance from the smoke, &c.; but since the engine has been set to work we are very agreeably disappointed, as we seldom see any smoke; the little we do see, we understand, is when the fire is new lighted.

Rev. JOS. ROBERTSON,
ROBERT WATSON, Gentleman.
GEORGE WATSON, Gentleman.

Sneaton Castle, Whitby,
January 30, 1824.

THIS is to certify that I have examined Mr. George Chapman's invention for the consumption of smoke arising from furnaces of steam engines, &c., and I find it answer every purpose preferable to any other that I have yet seen, and consider it worthy of the notice of the Society for the encouragement of Arts and Manufactures.

JAS. WILSON.

Whitby, January 30, 1824.

Having examined the apparatus invented by Mr. George Chapman of this place, to prevent the emission of dense smoke from the furnace of his steam-engine, and having seen it brought to the test of experiment, I am fully satisfied as to its success; and have no doubt, that were the same apparatus generally adopted, the smoke from such furnaces would no longer be a nuisance to the vicinity.

George Young, A. M.
Secretary to the Whitby Literary and
Philosophical Society.

Whitby, January 30, 1824.

I beg leave to state, that I have visited Mr. George Chapman's foundry, for the purpose of witnessing his improved method of consuming the smoke which is generated in furnaces. Mr. Chapman's plan, as he observed, seems to consist, principally, in admitting the atmospheric air necessary for combustion along the heated bars of the fire grate, which are cast hollow for that purpose. The air being heated in its passage, more readily gives out its oxygen, by which the generation of smoke is nearly prevented, and the process of combustion more accurately performed.

On the application of fresh fuel, the smoke which ascended from the chimney assumed the appearance of a light grey vapour, and in a few seconds became nearly invisible.

The superiority of Mr. Chapman's method was further evinced by opening the door of the furnace and allowing a quantity of cold atmospheric air to enter in the usual way; when this was done, the smoke rolled out of the chimney in black dense clouds, which effect ceased almost immediately on closing the door.

RICHARD MOORSOM, Jun.

No. V.

EAST INDIAN ANNATTO.

TOWARDS the conclusion of the session 1822-3 the Society received a communication from James M'Killop, Esq. King's Arms-yard, Coleman-street, consisting of a note from that gentleman, a letter from Cruttenden, M'Killop, and Co. of Calcutta, and a few cakes of East India annatto.

The Society had, during some preceding years, offered a premium to the person who should import from any part of British India a certain quantity of annatto, equal in value as a dyeing drug to that which is produced in several of the late Spanish American colonies, and which is brought into this country under the name of Spanish annatto.

It appears from the letter of Cruttenden, M'Killop, and Co. that Messrs. C. Stewart and Co. lac-dye manufacturers in the Bancoorah district, Bengal, had been preparing, with great care, a small quantity of annatto, for the purpose of being distributed among the silk dyers of London, in order to obtain their opinion as to its value. It was their desire also that samples should be sent to the Society for the encouragement of Arts, Manufactures, and Commerce, not in claim of the premium offered, (for the quantity imported was not large enough to entitle them to come as candidates), but that the Society might institute some experimental enquiries respecting the probable utility of the article.

The Society directed their acquiescence in the request of Messrs. Stewart and Co. to be signified to Mr. M'Killop, and that gentleman, in consequence, transmitted to the Society the whole of the annatto, about 6lbs., which still remained in his possession.

The Spanish annatto is a fecula of a dark red colour, obtained in various parts of South America from the seeds of a plant, the *bixa orellana* of Linnæus, called *urucu* by the natives, and *roucou* by the French planters of Cayenne and the West Indies.

The seeds being collected, are bruised, moistened with water, and fermented; the resulting paste is then washed with water, which suspends the colouring particles. This turbid liquor being heated, the fecula rises to the top in the state of a thick scum, which is removed, and packed in leaves for exportation, forming what is known in commerce by the name of flag annatto. The French dry the annatto before packing it up; but that which is imported from the Spanish settlemens to this country being packed in a moist state, soon passes into the putrefactive process, and when it arrives in Europe has become extremely offensive to the smell.

The East Indian annatto is said to be prepared from the pulp of the seed capsules of a plant, the *metella tinctoria*, which grows wild in the neighbourhood of Seevendroog and in other parts of India. The sample sent to the Society is in the form of small thin cakes, perfectly dry, inodorous, and of a deep but dull orange red colour.

The first experiment made under the inspection of the committee of Chemistry, was at the dye-house of Mr. Reynolds in Spitalfields. Three of the cakes being ground up with a solution of potash were mixed with a hot solution of soap; the mode of proceeding being the same as that practised by Mr. Reynolds in preparing a vat of Spanish annatto. Skeins of white silk being dipped in this bath took a full orange colour, in the opinion of Mr. Reynolds, as bright and perfect in every respect as that given by the best Spanish annatto.

The next experiment was made at the dye-house of Mr. Jourdaine in Grub-street. Spanish and East Indian annatto, having each undergone the same previous treatment, were digested in a solution of pearlash in equal proportions, and then diluted with equal quantities of scalding water. Skeins of white silk were then dipped in each: those in the Spanish annatto came out of a full bright aurora, or orange red colour; those in the East Indian came out of a gold yellow colour. The first bath was almost exhausted, the second seemed quite as rich in colour as before the silk was dipped in it; showing that, when subjected to Mr. Jourdaine's process, the colouring matter of the East Indian annatto is possessed of but a very feeble attraction for silk. The skeins which had acquired the golden yellow colour became of a red (somewhat foxy) orange, by being passed through water acidulated with sulphuric acid; but there is an objection to the use of this latter process, as silk so treated is very liable to *scroop*, that is, to be harsh to the feel.

The small quantity of East Indian annatto that remained was then put into the hands of Mr. H. Hennell, a member of the Society, by whom the following facts were ascertained.

The Spanish annatto, as imported, contains sixty-one per cent. of water: the East Indian contains none. When the two have been brought to an equal state of dryness, alcohol takes up from the East Indian variety sixty-three per cent. of colouring matter, and from the Spanish only fifty-two parts.

Portions of each variety being dissolved in ammonia, in potash with or without heat, and in a mixture of potash and ammonia, communicated to skeins of silk various tints of colour from pale gold to full orange red, the superiority being sometimes in favour of one and sometimes of the other variety.

PAPERS

IN

POLITE ARTS.

No. I.

MENSTRUUM FOR BITING-IN ON STEEL PLATES.

The LARGE GOLD MEDAL *was this session presented to Mr.* EDMUND TURRELL, *Clarendon-street, Somers-town, for his* MENSTRUUM FOR BITING-IN ON STEEL PLATE. *The process was repeatedly performed before the committee with complete success: and the following communication on the subject has been received from Mr. Turrell.*

THE demand that has taken place for engravings upon decarbonized steel plates, on account of their great durability when compared with copper plates, has caused many eminent artists to employ their talents upon that peculiar preparation of metal; and many beautiful specimens of line engraving have been produced, capable of yielding proofs or prints to an extent unknown before the invention and application of that peculiar preparation of steel, which was first, I believe, made known to the world by Mr. Perkins, who has made use of it very extensively in his bank-note manufactory in the United States of America, and more recently in London.

If the execution of a fine engraving upon such prepared or decarbonized steel had depended entirely upon the graving tool, the principal difficulty that presents itself would be the superior hardness of the metal, which of course would offer greater resistance to the action of the graver than copper; but as most or all the engravings of the present time are a mixture of etching and graving united, it was of course equally necessary for the artist to be able to etch and bite-in upon decarbonized steel, as well as to *cut* with the graving tool.

In order to form a just idea of the difficulties that occur in etching and biting-in upon steel plates, it will be necessary to state a few facts relative to etching upon copper.

The usual method is to cover the copper plate with a coat of varnish, commonly called etching ground; and when the lines that are necessary to represent the subject are cut through the varnish with a point or needle, a border or rim of soft wax is raised round the sides of the *plate*, and nitrous acid, sufficiently diluted with water, is poured upon the whole surface, and immediately a corrosion of the copper takes place in those parts or lines where the varnish has been removed or cut through. The action of the acid is at the same time rendered obvious to sight by the continual formation and disengagement of bubbles of nitrous gas on all the etched parts, thus indicating to the artist *how* the process is going on.

Various acids have been tried for this purpose, both singly and compounded in various proportions; but experience has proved that very pure nitrous acid is superior to any compound that has hitherto been produced, and I believe it is also superior to any other acid that can be used singly; for there is one requisite that is absolutely necessary and indispensable, namely, that whatever acid is used, it should not only have a powerful affinity for the copper, and by its chemical action corrode and deepen the etched lines, but it should also be capable of holding the oxide formed in perfect chemical solution, otherwise the lines would soon be choked up by a deposition of the oxide so formed: as the deposition increased, the oxide would press upon the edges of the etching varnish and loosen it, by which means a partial corrosion would take place under it, and shallow lines would be the consequence. The lines produced under such circumstances are also generally rough and uneven on their edges. The process just described is technically called *biting-in*, and such a production would be called a bad *biting*. On the contrary, when the oxide of copper formed during the process is immediately dissolved in the fluid that forms it, a fresh surface at the bottom of the line is continually offered to the acid to act upon, and then the corrosion produces the very best effect, that is to say, very deep lines, with beautiful clear and even edges.

When etching upon steel was first introduced, great difficulty was experienced in biting-in the etched plates, for, whatever acid was used, it invariably happened that the lines when corroded were exceedingly shallow and rough upon the edges, many times so much so as to cause serious disappointments and great loss to those engaged. Such, indeed, was the risk of failure, that several artists have refused to execute any thing on steel, on account of the difficulty of biting-in their etchings.

I believe I am correct when I state that Messrs. Perkins and Heath paid the late Mr. Lowry fifty pounds for the secret of a menstruum that would effect the biting on steel in a manner superior to that which they had previously practised. It is but justice to state that, previous to purchasing the before-named secret, their method was stated to all who applied to know it, and this consisted in using the worn-out acid that had been used for biting-in copper plates, which therefore was an acidulous nitrate of copper in the state of solution. But with this the results were very unsatisfactory, and almost always the lines were so much shallower than those produced on copper, that the proofs from the plates in that state were very grey and spiritless, for want of depth to hold the proper quantity of ink.

No person was more sensible of this defect than the late Mr. Charles Warren, and the method of biting-in upon prepared steel invented by him, and communicated to the public in the Transactions of the Society of Arts, &c. vol. 41, fully evince how warmly he entered into the investigation; and also, when he had attained a better method than was generally known, how liberally he presented it to his brother artists.

Had Mr. Warren stated in his communication that perfection was attained by his method, I should have conceived it an invidious task to dispute that point by offering to the Society's attention a method of biting-in etchings executed upon steel plates, which I feel confident has many advantages over any at present generally made known. But I am relieved from any such considerations by the recollection of his expressions to the committee, that he not only came forward to contribute what he had invented, but was also very desirous to elicit facts and information, by leading others to make experiments on the subject, as he had done. I therefore trust that those who respect his memory, and feel grateful for his communication, will consider that I am following his example; and although I may not have found out a faultless improvement, yet that much new light will be cast upon the subject, tending to elicit new facts, and thereby bring to speedy maturity a process that, in its present infant state, has many great and vexatious difficulties attached to it.

Shortly after Mr. Warren made his invention known to this Society, I was requested to execute some etchings on steel plates; but, previous to assenting, I thought it necessary to try how far the menstruum of Mr. Warren's invention would do for biting in the even tints produced by machine ruling, that being a kind of work more calculated to show the imperfection of bad biting than any other. And more particularly so when three lines are used to produce those aerial tints that are necessary to form the back grounds to portraits, and to many other subjects, which, if produced by the graving tool, would (upon steel) be enormously expensive.

Having prepared the menstruum according to the directions given, I certainly felt great difficulty in preventing a precipitation of the copper, which, filling the lines, continues to accumulate; and, by its pressure as it increases, removes the etching varnish partially from the sides of the lines, and thereby causes, in a great degree, the shallowness before complained of.

I have no doubt that on very small plates it may be possible to sweep the surface of the plate with such rapidity that this evil may in a great degree be prevented; but upon large plates, where they are covered with work, such an operation will be attended with great difficulty, and in many instances will be nearly impossible.

In biting-in on copper plates, the breadth of the etched line is in a great degree indicated by the size of the bubble of nitrous gas formed on the line; but where the lines are filled or covered with the precipitated copper, the difficulty of judging of the state of the biting is greatly increased.

These and other difficulties incited me to give the subject every attention in my power. The first indispensible requisite (as it appeared to me) was to determine what acid would most readily corrode the lines etched upon the steel plate; and, after trying a number, nitric acid, reduced to a proper strength by dilution, appeared to me the best adapted to this purpose, provided some means could be found of preventing it from depositing the oxide of iron after having taken it up.

Chemists well know that iron exists in two states of oxidation, the protoxid and the peroxid, and that each of these oxids will combine with acids forming two genera of ferruginous salts, the proto-salts and the per-salts. The proto-salts contain a larger proportion of oxid than the soluble per-salts; and being liable to pass into this latter state by long keeping, or in a short time when exposed to the air, their solutions will sooner or later become turbid, and will deposit peroxid of iron in a state scarcely at all soluble, except by being digested in hot acid, combined with some deoxidating substance.

For this reason it is that the action of nitric acid diluted with water will seldom give satisfactory results when employed for biting-in; for although at first it acts very well, the iron being brought merely to the state of protoxid, and dissolving freely in the acid, yet by exposure to the air, during the process of biting, it passes to the state of peroxid, a portion of which precipitates, and, falling into the lines of the etching, covers the surface of the steel at the bottom of these lines, and thereby impedes and renders irregular the action of the acid.

Knowing that calico-printers prefer making their solution of oxide of iron in pyroligneous acid, I conceived that, when in its pure state, this would be a very proper fluid to dilute the nitric acid with; because it would not only tend to reduce its action, but might prevent, or at least impede the precipitation of the oxide formed in the operation of biting. Although, however, something was gained by this addition, yet it did not appear to be so effectual upon repeated trials as to leave me completely satisfied. It then came into my mind that alcohol, and, still more, ether, have a very powerful deoxidating effect, as they are able to separate gold, in its pure metallic state, from its solution in aqua regia. I determined, therefore, upon adding to the mixture of pyroligneous and nitric acids a portion of alcohol, expecting that the nitrous ether resulting from this combination being presented in its nascent state to the nitrate of iron formed during the biting, would retain it in the state of proto-nitrate, and thus prevent any precipitation. I am happy to say I was not in the least disappointed; for with a menstruum thus formed or compounded of the three ingredients, namely, pyroligneous acid, alcohol, and nitric acid, I acquire the following advantages.

In the first place, it corrodes the steel with great facility, producing a beautiful, clear, and deep line; and upon a variety of plates the results were very uniform.

Secondly, it prevents the deposition of peroxid; as a proof of which I have kept some of the menstruum which had been employed for biting-in as long as six months, and could not discover any precipitation formed.

As a further proof of its power of holding the oxide formed in perfect solution, it will be distinctly seen that as soon as the corrosion takes place upon the steel plate the whole of the lines appear beautifully bright, and continue so until the biting-in is completed.

The proportions of the acids and alcohol are as follows: —take four parts, *by measure*, of the strongest pyroligneous acid, (chemically called acetic acid), and one part of alcohol, or highly-rectified spirits of wine; mix these together, and agitate them gently for about half a minute; then add one part of pure nitric acid; and when the whole are thoroughly mixed the menstruum is fit to be poured upon the etched steel plate.

When the menstruum is compounded in these proportions, very light tints will be sufficiently corroded in about one minute, or one minute and a half, and a considerable degree of colour will be produced in about a quarter of an hour. But the effect may be produced much quicker by the addition of more nitric acid, or it may be made to proceed much slower by omitting any convenient portion thereof.

The plate, when the mixture is poured off, should be instantly washed with a compound made by adding one part of alcohol to four parts of water; and the best material for stopping out any part that is sufficiently corroded is pure asphaltum dissolved in essential oil of turpentine, which of course must be of sufficient consistence to flow freely from a hair pencil. It may be necessary to inform those engravers that use the common Brunswick-black to stop out the bitings on copper plates, that it is a very improper article to use on steel plates; because, as the asphaltum and oil of turpentine of which it is principally composed do not render it sufficiently drying, these ingredients are digested with a small quantity of spirit of wine, which has a great tendency to unite with the biting menstruum above described, and thereby cause foul biting.

As I attach considerable importance to the purity of the ingredients of which my menstruum is composed, I beg leave to impress on my brother artists the necessity of strict attention to this circumstance: I have myself obtained the ingredients in a state entirely to my satisfaction from Mr. Desormeaux, 16, Chalton-street, Somerstown.

I am, Sir,
&c. &c. &c.
EDM. TURRELL,
46, *Clarendon-street,*
Somerstown.

A. Aikin, Esq.
Secretary, &c. &c.

No. II.

NEW MODE OF EMBOSSING ON WOOD.

The SILVER ISIS MEDAL and TEN GUINEAS were this session presented to Mr. J. STRAKER, Redcross-square, Cripplegate, for a method of producing EMBOSSED *DESIGNS ON WOOD. Specimens of the same were laid before the Society, and have been placed in the repository.*

RAISED figures on wood, such as are employed in picture frames and other articles of ornamental cabinet work, are produced by means of carving, or by casting the pattern in Paris plaster or other composition, and cementing or otherwise fixing it on the surface of the wood. The former mode is expensive; the latter is inapplicable on many occasions.

The invention of Mr. Straker may be used either by itself or in aid of carving; and depends on the fact, that if a depression be made by a blunt instrument on the surface of wood, such depressed part will again rise to its original level by subsequent immersion in water.

The wood to be ornamented having first been worked out to its proposed shape, is in a state to receive the drawing of the pattern; this being put in, a blunt steel tool, or burnisher, or die, is to be applied successively to all those parts of the pattern intended to be in relief, and at the same time is to be driven very cautiously, without breaking the grain of the wood, till the depth of the depression is equal to the subsequent prominence of the figures. The ground is then to be reduced by planing or filing to the level of the depressed part; after which, the piece of wood being placed in water, either hot or cold, the parts previously depressed will rise to their former height, and will thus form an embossed pattern, which may be finished by the usual operations of carving.

No. III.

ENGRAVING ON STEEL PLATE.

In the 41st volume of the Society's Transactions will be found a paper drawn up chiefly from information furnished by the late Mr. C. Warren, on the art of engraving on steel plate as distinguished from engraving on blocks of steel, which latter process was first reduced to practical utility by the skill of Mr. Perkins. The subject was again brought before the Society, during the last session, by an interesting communication from Mr. Turrell on the best menstruum for biting-in on softened or decarbonized steel, which communication is inserted in the present volume. The attention of the Society having been thus in an especial manner directed to the subject of engraving on steel, it was with great satisfaction that they found themselves enabled, through the liberality of R. H. Solly, Esq., one of the chairmen of the Committee of Polite Arts, to present to each member, together with the 42d volume, an impression from a decarbonized steel plate of a subject engraved in mezzotinto by that eminent artist C. Turner, Esq.

Mr. Solly's letter on the subject is subjoined, as well as an historical notice concerning this branch of art from the pen of Mr. Turner.

Sir, Great Ormond-street, June 1, *1824.*

As the Society have materially contributed to promote the art of engraving on steel, and as their Transactions contain some valuable communications on preparing and etching upon steel plates, I thought a frontispiece* engraved on steel would be a very appropriate embellishment to the 42d volume of the Society's Transactions.

I requested my friend Mr. Charles Turner to engrave a plate for me on steel, from a picture painted by Sir Joshua Reynolds, a proof of which I have sent for the inspection of the Society; and, should it meet with their approbation, I shall have great pleasure in presenting them with impressions from the plate for their 42d volume.

I am, Sir,

&c. &c. &c.

R. H. Solly.

A. Aikin, Esq.
Secretary, &c. &c.

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[*] The committee being of opinion that the plate might be injured (on account of its size) if bound up in the volume, have resolved, that it be delivered to the members at the same time as the volume, but separate from it.

ON THE INVENTION, PROGRESS, AND ADVANTAGES OF THE ART OF ENGRAVING IN MEZZOTINTO UPON STEEL.

SIR, London, October 14, 1824.

THE discovery of a method of engraving in mezzotinto upon steel may be justly regarded as one of the most fortunate occurrences in the history of the graphic arts. In the infancy of this invention, as in that of almost every other, difficulties repeatedly presented themselves, but these have been successfully overcome; and the art, an outline of the gradual advance of which I am about to subjoin, may at present be considered as arrived at a state of full and vigorous maturity.

In the year 1812, that distinguished ornament and benefactor of his country, the late Mr. James Watt, suggested to me the possibility of engraving in mezzotinto upon steel; but all the attempts with which I immediately followed up the communication were unsuccessful. The hardness of the steel induced me to lay that metal wholly aside; and some experiments which I subsequently made upon plates of brass were attended with no better results: these latter substances were so unequal in their temper, that I found them quite unfit for my purpose.

It was not, therefore, till the very recent date, when Mr. Jacob Perkins, (whose indefatigable labours and extraordinary inventive powers are so well known and so highly appreciated), had produced blocks of steel soft enough to receive the impressions of our tools, and form a ground upon which we have been able to accomplish every

Digitized

thing required, that the art of engraving in mezzotinto upon steel can be said to have had its commencement.

In the month of January 1820, Mr. Say made an engraving on one of Mr. Perkins's blocks, and it was decidedly the best specimen then produced. In February 1821, I engraved a portrait on the first steel plate I ever saw. It had been given to me by the late Mr. Lowry, and it turned out so satisfactorily as to meet the approbation of Sir Thomas Lawrence.

On the 30th of May 1822, Mr. Lupton received the gold medal from your Society, for his admirable performance, the Infant Samuel. From the good fortune which has crowned the latter experiments, steel plates have obtained a decided preference over those of copper for engraving in mezzotinto; and the beautiful specimens now before the public, from the hands of Messrs. Ward, Reynolds, Say, Lupton, and other artists, require only to be *seen* to be admired.

In engravings in mezzotinto upon steel, the tones are far better defined than those obtainable upon copper. From the superior density of the former metal, the clearness of the lighter tints is carried to much greater perfection; and, from the same cause, the darks have also a decided preference, being distinguished by their superior richness. The advantages in these respects are so numerous, that all the deficiencies, which were formerly irremediable in mezzotinto engraving, are now entirely mastered; and the numerous difficulties with which the artist was always contending completely dissipated: although the process is much longer and more tedious on steel than on copper; yet, when completed, it is so perfectly satisfactory as fully to reward the additional labour. The instruments used in engraving in mezzotinto upon steel are precisely the same as those employed in engraving upon copper. When a deep black is required, twice the number of ways will be found desirable: from sixty to a hundred will not be too many. Steel plates are now so well prepared, and are become so common, that they are easily obtained by all who desire them; the best are those manufactured by Mr. Rhodes and Mr. Hoole of Sheffield, who have paid every attention to rendering them fit for the purpose of the artist: they may also be had of Mr. Harris, Shoe-lane, London.

I believe that I shall not be thought to entertain an erroneous opinion, when I express my belief that it is solely to the introduction of engraving upon steel into this country by Mr. Perkins that we are indebted for the present successful application of the same metal to the art of engraving in mezzotinto.

In conclusion, it may be serviceable to add a warning and receipt, which the novelty of the use of steel in the art of engraving somewhat imperiously requires:—Great care should be taken to save the steel from rust, which is done by warming the plate, and rubbing sheep's suet (from the animal) over it, and keeping it near a fire, or in a dry room; without this precaution much mischief will arise.

I am, Sir,
&c. &c. &c.
C. TURNER,
50, *Warren-st., Fitzroy-sq.*

A. Aikin, Esq.
Secretary, &c. &c.

No. IV.

PREVENTING FRAUDULENT ERASURES IN BANKERS' CHECQUES.

The Thanks of the Society were this Session voted to Mr. JOSEPH FINCHER, *Assistant Secretary to the Royal Institution of Great Britain, for his proposed plan for preventing* FRAUDULENT ERASURES IN BANKERS' CHECQUES.

INSTANCES not unfrequently occur df frauds being committed on bankers by persons who, having got possession of a checque drawn for a small amount, discharge, by certain well known chemical applications, the words and figures that indicate the sum, and substitute a larger in its place. In order to prevent this, checques are often printed on tinted paper, liable to be discoloured by the substances usually applied to discharge the writing, and therefore rendering obvious any attempt at falsification. The perverse ingenuity of those who benefit from such frauds has, however, frequently evaded this obstacle; and an easy and effectual method of detection is still a desideratum.

The plan proposed by Mr. Fincher is extremely simple, is attended with no additional cost, and if put in practice is an absolute preventative against any serious loss on the part of the drawer or of the banker. It consists in having nine parallel lines drawn longitudinally over the face of the checque, and in printing at the beginning of the first line the word ten, at the beginning of the second line the word twenty, and so on to the last, which is indicated by the word ninety. The sum drawn for is to be placed on that line the number of which corresponds with that of the tens in the sum itself, and the signature is to be also placed on the same line. Thus if the sum 85*l*. 13*s*. 6*d*. is drawn for, it is to be written on the line marked eighty, the signature being on the same, according to the annexed diagram.

The utmost, therefore, that a fraudulent person can obtain, by erasing the sum drawn for and substituting another, is the difference between the former and the largest sum which can be placed on the same line.

It will be necessary to have three sets of cheeques,—the first for sums below £100, the next for sums below £1000, and the last for sums below £10,000; and this necessity on the part of the drawer, of having three sets of cheeque-books, will be some additional trouble to him. Another objection is, that some persons, from carelessness or want of previous instruction, have contracted so irregular and straggling a mode of writing, especially of signing their names, as to be incapable of writing it on a straight line without such a difference in the character of the hand as to occasion doubts, on the part of the banker or his clerks, of the authenticity of such signature.

How far these objections, which appear to be only accidental, should be allowed to weigh against a plan possessed of so much intrinsic merit and simplicity, can perhaps be duly estimated only by professional men, to the deliberate and candid consideration of whom the Society take the liberty of recommending it.

No. V.

PREVENTION OF FORGERY.

In the year 1818 the Society, being deeply impressed with the alarming frequency of the crime of forgery practised both against the Bank of England and against several of the country banks, resolved to investigate the subject, for the purpose of ascertaining if any means existed of raising up additional obstacles in the way of the forger. The result of this inquiry was published by them in the following year; and the edition, although a large one, having been disposed of, it was resolved, previously to the publication of a second, again to open the investigation. The additional matter thus obtained, (and for which the thanks of the Society have been voted to the several contributors), consists of a plan for the construction of bank-notes, proposed by Mr. Ferguson of Newman-street, and of specimens of engine-turning, applicable to the ornaments of bank-notes, presented to the Society by Mr. Lea and Mr. Palmer.

The plan of Mr. Ferguson is the following:

A set of letter punches is to be cut by one of the best artists in this department. The size of the letter is to be rather small; and it is to differ from common type in the up and down strokes being of the same thickness, and in the projecting parts of the ascending and descending letters being shortened in order to lessen the white spaces between

No. London, 182

Tens.

Pay or Bearer

Pounds

Twenty

Thirty

Forty

Fifty

Sixty

Seventy

Eighty five pounds 13/6 (Signature.)

Ninety

(Banker's name.) £85 .. 13 .. 6

T. and J. B. Flindell, 8, North-street, Lambeth.

No. London, 182

Hundreds.

Pay ______________________________ or Bearer

One Hundred ______________________________

Two Hundred ______________________________

Three Hundred ______________________________

Four Hundred ______________________________

Five Hundred ______________________________

Six Hundred ______________________________

Seven Hundred ______________________________

Eight Hundred ______________________________

Nine Hundred ______________________________

(Banker's name.)

T. and J. B. Flindell, 8, North-street, Lambeth.

No. London, 182

Thousands.

Pay ______________________ or Bearer

One Thousand ______________________

Two Thousand ______________________

Three Thousand ______________________

Four Thousand ______________________

Five Thousand ______________________

Six Thousand ______________________

Seven Thousand ______________________

Eight Thousand ______________________

Nine Thousand ______________________

Ten Thousand ______________________

[Banker's name.]

T. and J. B. Flindell, 8, North-street, Lambeth.

the lines. The shoulders or margins round each letter are also to be reduced, so as to diminish the proportion of white. A fount of this letter having been obtained in the usual way, a page is to be set up of the size of a bank-note plate. This page is to be a portion of the Bible, or of some other well known book, and the several paragraphs of which it consists are to succeed each other without the interposition of any of those breaks or white spaces which occur in common printing. An impression from the page so set up, when held at such a distance from the eye that the individual letters become no longer visible, will present an uniform grey tint. A stereotype copy being made of this page, it is to be warmed, and melted wax is to be poured over it so as to fill up all the depressions in the letters, and to reduce the whole to one even uniform surface.

Upon the plate, thus prepared, the words, scroll work, and other ornaments of a bank-note are to be cut by some eminent artist; the wax with which the interstices are filled enabling him to produce good work, by preventing, in a great measure, the broken, interrupted motion of the graver, which would happen in cutting through a face of type without this precaution.

The engraving being finished, the wax may be removed by means of hot oil of turpentine, and an impression being then printed off from the plate, it is evident that the words, figures, &c. of the note will be in white on a grey ground; and this ground, consisting of many thousand letters of type, offers a multitude of intersections of white lines with black letters, in which intersections the security consists. The prototype plate being completed, impressions of it are to be taken, from which any number of stereotype plates may be obtained, and the original punches and matrices may be destroyed.

All the plates used in printing the notes being derived from the same prototype plate, every genuine note will necessarily be identical as far as relates to the intersections; and in order to ascertain the genuineness of a note each person will select any one or two intersections that he pleases, so that the forger has little chance of effecting his purpose, unless he obtains a very near resemblance in all the intersections.

There are four modes to which the forger may have recourse, namely:—type, engraving on metal, on wood, and lithography.

To the imitation of the note in type the following difficulties present themselves. The necessity of cutting a set of punches on purpose. The impossibility of ascertaining from the impression or face of a type (which is all that is shown in the note) its other dimensions; and the difference of a hair's breadth in the length or breadth of the shoulder of any one letter being multiplied by the number of times that such letter recurs in any line will render all the intersections of each line quite incorrect, and therefore obvious to detection.

The engraver in copper or wood, might, at a great expenditure of labour, produce a resemblance in the intersections; but would be foiled in the attempt to obtain, by the utmost dexterity of hand, that identity of form, in repetitions of the same letter, which necessarily occurs in the genuine note, such repetitions in this latter being casts from one matrix. It may also be mentioned as a farther difficulty in the way of the engraver on metal, that as his black lines are below the common surface of the plate.

whereas in type they are on the surface, the whites being below, it is impossible that an impression from the one can resemble, in its general aspect, an impression from the other.

Lithography unquestionably offers the most ready means of successful imitation; but the most correct transfers even of common writing, are so far from giving a perfect impression of the original as to render a passable copy of the proposed note wholly impracticable, provided care is taken to issue none but perfect impressions of the genuine one.

THE following letter from Mr. Lea, relating to his specimens of engine-turning, plates IV. and V., applicable to bank-notes, was ordered to be printed, and the thanks of the Society were returned for the same.

SIR, King-street, Clerkenwell, Nov. 1, 1824.

I RECEIVED yours, dated October 26, and will thank you to inform the Committee of Correspondence and Papers that I have no particular communication to make on the two plates they have selected as specimens of my engine-turning: all that can be said in a general point of view has been done by the Society, in their report on preventing the forgery of bank-notes (*vide* page 7).

To describe the rose-engine, as to its construction and component parts, would be but of little service, when it is very well known that the mathematical exactness, and the soft, delicate appearance and shade of work executed on it, and which, to a common observer, leaves the finest engravings far behind, arises entirely from the abilities and taste of the artist employed. To describe all these would require a volume.

At the time I turned the two plates I did not know of any thing I could have added that would have made them more difficult to copy; but I am happy to say now I have made considerable improvements on the engine since that time.

Daily experience convinces me that the powers of the rose-engine are but little known; and it is to future time that the persevering artist must look for a reward for his labours, by producing specimens so novel and various, that the mind of man is incapable of contemplating at *present*.

The rose-engine is superior to most, if not all, of the most complicated engines and pieces of machinery: *their* movements and powers are limited, *its* are unknown, and may be carried to an endless variety in the hands of an ingenious artist. The engine which the two plates were turned by, without any additional movements, would be capable of executing an endless variety of patterns, all different, *yet* all alike beautiful, and with that mathematical exactness which is one of its great characteristic properties.

As my principal study has been to produce something *new* from the engine, it is but reasonable to suppose that in some instances I have been successful, but in no one have I been so fortunate as lately in that of scroll-work; this *is* new, and so beautiful in its appearance and *difficult* to execute, that the other specimens of engine-turning are far inferior to it.

Should the bank directors ever seriously attempt to prevent bank forgeries, a note with a design engraved by a first-rate artist, and a proportionate quantity of rose-engine turning executed in the first style, would probably be the only means of preventing forgeries, as so few persons could be found capable of producing anything like it.

I flatter myself the gentlemen of the committee will consider any farther explanation unnecessary, for two reasons: first, the short time allowed me; secondly, the quantity of matter that would be required to explain the intricate movements of the engine, should it be prudent to do so.

I am, Sir,
&c. &c. &c.
WILLIAM LEA.

A. Aikin, Esq.
Secretary, &c. &c.

THE following letter from Mr. W. Palmer, relative to his plate of engine turning, plate VI., applicable to bank-notes, was directed to be printed, and the thanks of the Society were voted to Mr. Palmer for the same.

18, Clifton-street, Finsbury-square,
November 9, 1824.

SIR,

IT being the intention of the Society of Arts, in their next Bank Note Report, to publish my specimen for the prevention of forgery; and thinking, with the committee, that my opinions should accompany it, I beg to offer the following remarks, which are the result of eighteen years' practice, much observation, and great expense.

There are three distinct branches of engraving, which may be blended together to produce a perfect whole, (at least as far as human nature can go), writing, vignette, and engine engraving; and unquestionably the first ability in the country should be employed to produce each of these. The first mentioned, (writing), I hesitate not in pronouncing the least in consequence, as it consists of extended parts, with which the eye of the public can never become so familiar as to discover that variation from the original which is the characteristic of a forgery: thus it is that strangers to the art of engraving fix upon the figure of Britannia, in the present Bank of England note, to form their opinion, not that it possesses any superior execution, but because, from its compactness and partial systematic division of space, it is brought within the focus of the eye:—then is it not obvious that a well executed vignette would protect the public more, as the artist would work from principle, knowledge, and taste? I will admit that an inferior engraver can copy that which he could not produce; but I will maintain that the forger's success will decline in exact proportion to the increased ability used to produce the original. But as vignettes are the product of the hand, they are still subject to all those inaccuracies which are peculiar to our nature; and for this reason I prefer engine engraving, which is, in my opinion, by far the best method, because it approaches nearer perfection. It embraces what writing does—utility; it presents that which vignettes do—beauty; and it offers what our country prays for—security. This must be evident to every thinking man, and to engravers I will say that practice points it out, observation declares it, and reason confirms it. With the engine a systematic division can be obtained, and figures of almost every description formed, and such symmetry preserved that the most experienced engraver would find it almost impracticable to effect the same by the hand. As I have shown why engine work is to be preferred, the next point to be considered is the best arrangement of those lines which may be produced by an engine.

Simplicity is the cry of many, but I treat that cry as the voice of interest or inexperience. If it were impossible to procure a second machine I would then grant that simplicity of figure would be most desirable; but of what advantage can that production be (although it may defy manual labour to produce its equal for beauty and equalization of space,) when machines out of number may be procured that will effect the same thing? This is why I object to the common ruling machine being brought into requisition for bankers' notes; and this is the reason also why intricacy is the best method of preventing forgery: the lines can be so interwoven that their primitive figure may be disguised: when this is done all is done that can be; it puts aside the exertions of the hand, and leads the mechanist into a labyrinth of doubts and uncertainties. The result of such a disposal of the lines will be a peculiar character, which is only attainable by similar means; and if others are used, a difference must follow, and the attention of the most hasty observer will be arrested by something irregular, which must naturally lead to a closer examination.

It has been a prevailing opinion that the public have not the power of discriminating between good and bad engraving. This proves the necessity of a departure from the present system of the Bank of England note, which cramps the abilities, and prevents an opportunity even of forming a judgment upon it.

It is recorded that the herb women of Athens were capable of judging between good and bad oratory; the reason is manifest, for they were imperceptibly taught from hearing it daily; not that they could assign a reason, but because they were familiar with that which was perfect. In like manner I would so familiarize the eye of the people to a perfect engraving, that when a spurious production presented itself they would instantly detect it. Then teach them, and teach them without their knowing how they are taught; this is the earnest recommendation of yours,

&c. &c. &c.

WM. PALMER.

A. Aikin, Esq.
Secretary, &c. &c.

PAPERS
IN
MANUFACTURES.

No. I.

CLOTH FROM NEW SOUTH WALES WOOL.

The Gold Isis Medal, *the premium offered, was this session presented to* D. Maclean, *Esq. of Basinghall-street, for* Cloth manufactured entirely from fine wool the growth of the colony of New South Wales. *The following communication was received from Mr. Maclean on the subject, and a specimen of the cloth has been placed in the Society's repository.*

7, Basinghall-street, London,
February 24, 1824.

Sir,

I send for the inspection of the Society of Arts, &c. a piece of blue cloth manufactured from wool the growth of New South Wales, by Messrs. Harris, Stephens and Co. of Stanley Mills in the county of Gloucester; and I here-

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with beg to hand you certificates of the origin of the wool and value of the cloth.

I am, Sir,
&c. &c. &c.
D. MACLEAN.

A. Aikin, Esq.
Secretary, &c. &c.

CERTIFICATES.

London, February 23, 1824.

I HEREBY certify, that on the 27th day of June, 1823, I sold at public sale, at Garraway's coffee-house, eighty bales of wool, imported by John Macarthur, Esq. in the ship William Shand, Captain Kenn, from New South Wales; and that at such sale Messrs. Harris, Stephens and Co. of Stanley Mills, Gloucestershire, purchased three lots of said wools, and the same were forwarded from Messrs. Cooper and Spratt's warehouse, where they were warehoused from the ship, to Messrs. Tanner and Baylis's waggon-warehouse, Whitecross-street, on the 28th of June, 1823, to be conveyed to their manufactory at Stanley aforesaid.

THOMAS EBSWORTH,
Sworn Wool Broker.

London, February 24, 1824.

WE hereby certify, that, in our judgment, the piece of blue cloth, No. 65112, B B 2, manufactured by Messrs. Harris, Stephens and Co. of Stanley Mills in the county of Gloucester, from wool of the growth of New South Wales, is worth, and will fetch in this market, forty-five shillings per yard.

HENRY HUGHES,
Blackwell-hall Factor, Basinghall-street.
THOMAS GREEN,
Blackwell-hall Factor, Coleman-street.

7, Basinghall-street, London, February 24, 1824.

I DECLARE upon my honour, that the piece of blue cloth No. 65112, B B 2, measuring thirty-eight yards, was manufactured by the house of Harris, Stephens and Co. (whereof I am partner), from wool imported from New South Wales, and bought by them at Marsh and Ebsworth's public sale, on the 27th June, 1823, as per annexed certificate; and that no other wool was mixed or used in the manufacture of said cloth.

D. MACLEAN.

SIR, Basinghall-street, March 2, 1824.

LEST any mistake should arise in consequence of my not stating to the Committee of Manufactures the price at which the blue cloth exhibited to them can be rendered to the public, as compared with cloth of Spanish or Saxon wool, I beg to state that thirty-one shillings per yard would be a remunerating price to the manufacturer; at which rate, I am of opinion, cloth of equal *softness*, from Saxon wool, cannot be afforded.

The committee is at liberty to retain a small portion of the cloth as a sample, if it is desired.

I am, Sir,
&c. &c. &c.
D. MACLEAN.

A. Aikin, Esq.
Secretary, &c. &c.

Brunswick-square, February 28, 1824.

IN manufacturing the wool of New South Wales the process usually employed in the manufacture of superfine cloth is pursued with but little variation. The process must be too familiar to a committee of Manufactures to require a minute description.

After a cloth is wove a great deal still remains to be done. The operation of fulling, which is the next stage from the loom, gives a consistency to cloth which distinguishes it from other wove fabrics: it produces a tendency in the fibres of the wool to cohere together, and form a compact and pliant substance, which enables it to resist the violent operation of the gig, to which it is submitted after the process of felting is completed.

This machine consists of a cylinder six feet by three, the surface of which is covered with teasels,* arranged in small frames. The cloth is stretched over this cylinder, which performs about one hundred and twenty revolutions in a minute. By this means the fibres of the wool on the face of the cloth are seized and pulled out by the teazel hooks, so as entirely to conceal the appearance of the thread.

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* A vegetable substance resembling the head of the thistle, with its points terminating in hooks.

This part of the process of dressing is attended with considerable difficulty, from the necessity of having the teasels placed so accurately in their frames as to enable the hooks to pull out only the points of the fibres without robbing the cloth of any of its substance. After a sufficient quantity of work has been applied in this manner the cloth is put upon the shearing frame, and the nap or pile that has been produced by the operation of the teasel, shorn off by means of shears or knives that are made to pass over the surface of the cloth for that purpose; and, finally, it is polished up at the brushing machine, which concludes the process.

In the manufacture of the cloth now exhibited the wool was found to work more freely in all its stages, with the exception of milling, or fulling, than any wools we have been in the habit of using. In this respect it does not *seem* to possess the tendency to union or coherence of fibres that the European wools possess.* The superior softness, however, of its nature, more than counterbalances this objection, and must render it always of great value for mixing with Spanish and German wools.

The cloth now under the consideration of the committee was manufactured from the wool of Mr. Macarthur's flocks, and is, I believe, the largest quantity, *of so fine a texture*, that has yet been produced from the wool of New South Wales. It is more than two months since it has been finished; and a gentleman who had a coat of it states to me, that he has constantly worn it during that period, and that it looks now as well as it did the first day, although he has travelled some hundred miles in stage coaches.

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* This may be said to be venturing an opinion, as it is impossible to speak decidedly on such slight experience.

Having a deep interest in the woollen manufactures of this kingdom, I anticipate with great satisfaction a period at which England may look to the remote but valuable colony of New South Wales for a considerable supply of this article, so closely connected with our comforts, affording many of the ornaments of social life, and contributing at once to the strength and the affluence of the country.

D. MACLEAN.

No. II.

HATS OR BONNETS OF BRITISH MANUFACTURE IN IMITATION OF LEGHORN.

THE two last and some preceding volumes of our Transactions exhibit the exertions which the Society has made in order to introduce the manufacture of hats, bonnets, &c. from whole straw, platted in the Italian manner. Hitherto these articles have been made in this country of wheat straw; but as this material is too coarse in its entire state for fine plat, a practice was introduced some years ago of splitting the straw into three or more lengths in order to obtain the requisite fineness. By so doing, however, the strength and flexibility of the straw were so far diminished as to render the fabrics composed of it wholly unequal to enter into competition with those imported from Leghorn, the consequence of which has been that the manufacture of split straw, which was carried on to a great extent and with good profit during the late war, suffered a ruinous deterioration when trade returned to its old channels on the arrival of peace, and conveyed to the English market hats, &c. of Italian plat far more beautiful and durable than those of our own manufacture.

Under these circumstances the Society imported and distributed seeds of a grass which grows wild in the state of Connecticut, U. S., and of the entire stems of which very beautiful plat is made by the wives and daughters of the New England farmers. The Society also conferred their large silver medal on Mr. Cobbett, for demonstrating the possibility of obtaining fine plat of good colour from the stems of some of our native grasses. In furtherance of this desirable object a premium of the large silver medal or fifteen guineas was offered last year to the person who should produce a hat or bonnet made from indigenous British grass, equal in texture and colour, to those imported from Leghorn. For this premium, during the last session, there appeared eighteen claimants: to three of whom the full premium has been granted, and to others such inferior rewards as their respective specimens appeared to merit.

The premium of *fifteen guineas* was given to *Lucy Holdowell* of Neithrop, near Banbury, for two bonnets manufactured by her of the crested dogs'-tail grass, (*cynosurus cristatus*). The grass was prepared and bleached according to the instructions printed by Mr. Cobbett. Up to February 1824, it appears, from the accompanying certificate, that she has made thirty-five ladies' bonnets and two gentlemen's hats.

The premium of *fifteen guineas* was given to Mrs. *Morrice* of Great Brickhill, Bucks, for a bonnet made by her of crested dogs'-tail grass.

The premium of *fifteen guineas* was given to ***Priscilla Surry*** of Harpingden, Herts, for a bonnet made by her of meadow fox-tail grass, (*alopecurus pratensis*).

The sum of *ten guineas* was given to *Betty Webber* of Clatworthy, Devon, for a bonnet made by her of crested dogs'-tail grass.

The sum of *ten guineas* was given to Mrs. *E. Mills* of Bath for a bonnet manufactured by her, as well as for instructing several poor persons in the same art.

The *silver Ceres medal* was given to *Mary Marshall*, mistress of Lady Bernard's school at Bandon, near Cork, for a bonnet made by her of crested dogs'-tail grass.

The sum of *five guineas* was given to the children of the school at Bandon, mentioned in the preceding article, for their proficiency in platting under the instruction of Mary Marshall.

The *silver Ceres medal* was given to Messrs. *James* and *A. Muir* of Greenock, for a hat face and thirty score of plat of different qualities. From the letter accompanying their specimen, it appears that they are endeavouring to establish, on a large scale, a manufacture of hats platted and knit in the same manner as those imported from Leghorn. The material which, in their opinion, answers the best, (and of which the specimens sent are formed), is rye straw dwarfed by being grown on poor land. The platting is performed by women and children in the Orkneys.

The *silver Ceres medal* was given to Mrs. *Mears* of Durley, Hants, for a bonnet of crested dogs'-tail grass platted under her direction and knit by herself.

The *silver Ceres medal* was given to Mrs. *Venn* of Hadleigh, Suffolk, for a bonnet made of crested dogs'-tail grass.

The *silver Ceres medal* was given to Miss *Mary E. Collins* of Dublin, for a small hat made by her of yellow oat-grass, (*avena flavescens*).

The *silver Ceres medal* was given to Mrs. *Pyman* of Coombs, Stowmarket, for a bonnet made under her superintendence, of crested dogs'-tail grass.

The *silver Ceres medal* was given to Messrs. *Cobbing and Co.* of Bury St. Edmunds, for two bonnets, a fine one made of crested dogs'-tail grass, and a coarser one made of underling wheat.

The sum of *five guineas* was given to Mrs. *E. Bloomfield* of Bury St. Edmunds, for a hat made of crested dogs'-tail grass.

The sum of *five guineas* was given to Mrs. *M'Michael* of Penrith, Cumberland, for a bonnet of grass in part procured from Mr. Cobbett, and in part prepared by herself.

The sum of *two guineas* was given to *Jane Hurst* of Leckhampstead, Bucks, for a bonnet made of bent grass.

The sum of *two guineas* was given to the children of the national school at Nunney, near Frome, for a bonnet made of cats'-tail grass, (*phleum pratense*).

All the specimens mentioned above so far resemble Leghorn bonnets that they are made not of split but of entire straw; and the pattern of the plat, and mode of knitting the edges of the plat together, are the same.

There appear to be three circumstances on which the value of a Leghorn hat depends.

First, the fineness of the plat. This depends on the fineness of the straw; the more slender the straw, the finer, that is, the narrower, will be the plat, and of course the greater will be the number of coils required to form a hat of a given diameter. If, therefore, a yard of fine plat were as easily made as a yard of coarse plat, (which probably is not the case), yet, as a greater number of yards will be required for a fine than for a coarse hat of equal dimensions, there must necessarily be a corresponding difference in the cost of manufacture.

The straw of most of the grasses is more slender than that of the wheat or rye employed by the Italian platters, and therefore some of the specimens produced in claim of the Society's premium are finer than any Italian plat; but extreme fineness can be obtained only at such a sacrifice of substance and strength as greatly to deteriorate the value of the article. Most of the English specimens, however, have sufficient firmness, with a degree of fineness that, as far as this character goes, entitles them to rank above the average of Leghorn hats.

The second circumstance to be attended to is the evenness and regularity of the plat; which depends in part on the uniform size of the straw made use of, and also on that precision of manipulation which can be acquired only by care, and practice, and natural dexterity. In this respect the real Leghorn is very superior to most of the above specimens, almost all of which present very obvious variations in the size of the plat, an imperfection which will, no doubt, be avoided hereafter by a more careful sorting of the straw.

With regard to the last circumstance, that of colour, although considerable differences are observable in the colour of Leghorn hats as compared one with another, yet each individual hat is as nearly as possible of the same tint in every part. Of the bonnets sent in claim of the premium a very few are uniform in their colour; and these are such as have been subjected only to the most simple bleaching process, namely, scalding the grass when fresh gathered, and subsequent exposure to the sun's light, and a moderate stoving with sulphur after the bonnet has been made. Several of the specimens sent have been very seriously injured in colour by the injudicious use of oxalic acid, and some are defective from want of sunshine when the grass was laid out after being scalded.

Upon the whole it appears to be satisfactorily proved, that the stems of the crested dogs'-tail grass are a material for plat considerably finer than the average quality of Leghorn; and that the deficiencies in texture and colour, of most of the bonnets produced before the Society, are only such as practice and experience will shortly remove.

The bonnets themselves, after being exhibited at the Society's rooms, were returned to the several candidates, and, in their stead, specimens, a few inches long, were required, in order to be placed in the repository. A few weeks, or months at the utmost, elapsed between the first sending in of the bonnets and the delivery of the specimens; and it is very gratifying to remark that the latter are all of them very considerably better in evenness of plat and in colour than the bonnets to which the rewards were adjudged.

No. III.

PREVENTING THE WATERING OF SILKS.

The sum of FIVE GUINEAS *was this session given to Mr.* PETER CARON, *of Church-street, Bethnal-green, for his method of* PREVENTING THE WATERING OF SILKS WITHOUT THE USE OF A KNEE-ROLL.

THERE are two imperfections which silks, especially plain ones, are liable to acquire in the loom. One, called cockling, is merely an unevenness of the surface, and arises usually from one longitudinal edge or selvage of the piece being more stretched than the other, in consequence of its not being wrapped evenly round the roll or cylinder of the loom. The other imperfection, called watering, is a wavy or streaky appearance, produced by a play of light on the surface of the silk, though that surface may be quite smooth. The cause of this wavy appearance is not completely understood, but appears in a great measure to depend on unequal pressure being given to the piece while on the roll. It is well known that the highest polish and gloss is given to silk in the hank by twisting it hard, and at the same time giving it a kind of oscillating movement, so that each individual thread may be rubbed repeatedly on those with which it is in contact, whereby they mutually polish each other. Now, a piece of silk in the process of manufacture may be conceived to be placed in circumstances considerably favourable to the production of this partial polish, if, when rolled tight and rather unevenly on the roll, it is subject to the vibration occasioned by the stroke of the lay upon the weft, which takes place after every throw of the shuttle.

The contrivance which used to be resorted to in order to prevent the watering of silks was by means of a knee-roll. The five or six yards which constitute an average day's work being first rolled on the large or breast-roller during the weaving, were every evening transferred to a smaller roll, called, from its position, a knee-roll. In doing this great care was required to lay each fold precisely upon the preceding one, a manipulation that occupied about half an hour; and the silk, by frequent handling, was apt to become soft and less saleable.

Of late years, attempts, more or less successful, have been made to avoid the use of the knee-roll, by inserting a sheet of thin glazed pasteboard at certain intervals between the folds of silk on the breast-roll, which, from its elasticity, yields to the vibration of the loom without communicating any motion to the silk, while its own smooth surface allows it to move a little on the surface of the silk without any injurious friction. The most successful application of this contrivance has been made by the candidate, Mr. Peter Caron, which although, perhaps, in part to be attributed to his own individual dexterity, (for by the testimony of the foreman of Mr. Leveque, for whom he works, he appears to be a remarkably careful, skilful weaver,) has been considered by the Society worthy of being made public for the benefit of others in the same trade, both workmen and masters.

The process is the following:

After a *porry*, (a quantity of five or six yards), has been wove and rolled on the breast-roll in the usual way during the weaving, it is to be unrolled, and carefully rolled again as evenly as possible, a sheet of pasteboard or pressers' paper being put into the last turn. When a second porry has been finished, it is to be again rolled as above described, the sheet of pasteboard inserted in the last fold of the former porry being first removed; but at the end of every second porry, or twelve yards of work, the pasteboard which has been inserted is to remain till the piece is finished, especial care being taken that the pasteboard lies as close on the roll as the work itself does. Mr. Caron has practised this method for three years, and during that time has not had a piece in the slightest degree watered. The kinds of work to which it has been applied have been gros de Naples, Florentines, and double-twilled sarsenets.

Plain sarsenets are very liable to cockle, or *run into ridges*, when the warp is uneven. This may be prevented by inserting a glazed pasteboard in every twenty-four yards of work, and leaving it there till the piece is finished.

PAPERS

IN

MECHANICS.

No. I.

CARPENTERS' PLANE.

The sum of FIVE GUINEAS *was this session given to Mr.* G. GLADWELL, *Lower Garden-street, Vauxhall, for a* PLANE FOR CARPENTERS; *a model of which has been placed in the Society's repository.*

THE object of the candidate, who is a working carpenter, has been to make one plane answer the purposes of the jack-plane, the pannel-plane, the smoothing-plane, and the moulding-plane. This he effects by having the bottom, or sole, of the plane moveable, being attached to the body of the instrument by means of a dove-tail groove. The workman, therefore, by being in possession of eight soles, flat, convex, or concave in different degrees and directions, and of five irons, with one stock or body, has an equivalent for eight separate planes, whereby an advantage is gained both in point of expense and also of portability. It is true that some time will be lost in changing the soles, when a man has to pass frequently from one kind of work to another; but after every reasonable deduction has been made on this account there appears to remain a fair preponderance of advantage in favour of the invention. Care must be taken that the wood employed for the soles is perfectly seasoned, otherwise they may warp, and make inaccurate work.

The following are the directions of the inventor relative to the construction of the plane.

Let one-third of the height of the plane be the thickness of the sole, having a dove-tail fillet (worked in solid, or glued and screwed on,) about three-eighths of an inch thick and two inches wide. In the upper part of the body of the plane make a groove for the fillet to slide in. The sole slides in from the front part of the plane, and secures itself against two brass stops or plates, one screwed on the back part of the plane, the other on the sole in front. The one on the back part answers for all the soles that may be fixed; but each sole must have one in front.

Reference to the figures.—Plate I.

THE same letters of reference denote the same parts in all the figures.

Fig. 3, A side view of the plane; *k k* the sole or bottom portion of the plane fitted to the upper part *l l* by a longitudinal dove-tail *m m*, shown by dotted lines; *n* a plate of brass screwed to the bottom piece *k*, to prevent its going too far, and *o* a plate of brass screwed to the upper portion *l l*, to stop the end of the dove-tail.

Fig. 4, An end view of the upper and lower pieces separate, to show the dove-tail and groove.

Fig. 5, A concave sole.

Fig. 6, A convex sole, with the brass plate *n* screwed on.

Fig. 7, A longitudinally convex sole.

No. II.

CONCENTRIC CHUCKS FOR TURNERS.

The LARGE SILVER MEDAL *was this session presented to* EDWARD SPEER, *Esq. of New Inn, for his* CONCENTRIC CHUCKS FOR TURNERS. *The following communication has been received from the candidate on the subject, and a model of his invention has been placed in the Society's repository.*

SIR, 7, New Inn, February 4, 1824.

I WISH to lay before the Society for the encouragement of Arts a chuck which I have invented, possessing, as I conceive, peculiar advantages. I shall be happy to attend and exhibit the same whenever the subject may come before a committee.

I am, Sir,
&c. &c. &c.
E. SPEER.

A. Aikin, Esq.
Secretary, &c. &c.

THIS chuck consists of a succession of hollow truncated cones, fitting with tolerable accuracy into each other, the outer one screwing on to the mandril, and turned like a common chuck: at the bottom is a detached circular plate of brass to force the cones out in case of any adhesion, but I have never found this necessary. It is calculated to obviate a necessity for numerous chucks which are applicable to different kinds of work, and to save a great deal of time which is lost in preparing materials, when in the rough, for turning: in fact it may be called an universal chuck whenever the back puppet is in use.

Every one acquainted with turning is aware of the trouble attending the first fitting a piece of wood to the lathe, which seems by this contrivance, simple as it is, to be entirely obviated. Nothing more is necessary than to remove one or more of the internal cones till there is sufficient room for the admission of the substance to be operated upon; and it affords particular facility for removing any work from the lathe (a screw, for instance,) which may require to be accurately fitted before it is finished.

The chuck at present before the committee is adapted to receive any work between 3¾ and one-eighth of an inch in diameter; but there can be no objection to its being carried to any extent in point of size that may be required. It appears equally well calculated for turning brass, iron, or steel, the chucking of which is, in general, rather a troublesome operation: and it possesses one advantage which is, I believe, peculiar to itself, namely, that it is nearly impossible to injure the tool employed; for, as the work is carried round merely by the friction on the inside of the cone, which may be increased or diminished at pleasure by moving the screw in the back puppet, in the event of the tool encountering a knot, or any other impediment, this friction is invariably overcome with less violence than would be requisite to break the point of the tool, and the work remains stationary.

The cones of this chuck are turned at an angle of about twelve degrees; but whether this may be the best proportion I am not prepared to say: probably, if it should come into general use, the angle might be determined by the kind of work to be performed.

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These cones are split in a spiral direction from an idea that their general expansion would create a solidity of the whole, which is certainly effected; and the spiral cut was adopted lest the coincidence of two or more might throw the work out of truth. But I apprehend that if care were taken in turning the cones that none of them touched the bottom of the chuck, they would be perfectly firm without any cut.

I have had a chuck of this kind made in brass with the cones of iron, but it is cumbrous and expensive, and does not answer so well, owing to the surface of the iron offering less resistance to the work turning within it. This, perhaps, might be remedied by roughing; but I think the chuck is much better in wood, as it can be made by any common turner at a trifling expense, and possesses more strength than can possibly be required.

Sir, 7, New Inn, May 4, 1824.

I beg to transmit the chuck for which the Society of Arts have honoured me with their silver medal. The only difference between it and the one which I have already furnished a description of, is that the cones are turned to an angle of ten degrees, and the spiral cut in them is omitted, as I find it is perfectly unnecessary, and considerably weakens the cones.

I am, Sir,
&c. &c. &c.
E. Speer.

A. Aikin, Esq.
Secretary, &c. &c.

Reference to the engraving of Mr. E. Speer's Concentric Chucks for Turners.—Plate III.

FIG. 1 is a section, and fig. 2 a front view of a chuck which consists of seven hollow cones placed one within another; the whole of them may be removed by pushing a pin through the screwed hole in the back of the chuck against the plate *a a*; the plate *a a* must then be replaced. The hollow cones, or chucks, may then be easily pushed out from within one another till one is found that will receive the end of a piece of wood, &c. that is intended to be chucked: they must then be replaced in their respective situations in the largest chuck, and screwed on the end of the mandril *b* of the lathe, as represented in fig. 3. The piece of wood *c*, intended to be chucked, must then be pushed into the hollow cone, and the conical centre *d* (of the puppet) must be screwed against the end of the wood, which will cause sufficient friction within the chucks, so that the mandril will turn round the chucks and the wood all together. These chucks will be found convenient for chucking the end of any irregular piece of wood when the centre *d* can be applied to the opposite end of it; and also for chucking a piece of wood, that has been turned, when the centre has been cut off one of its ends. The chucks may be made of box, or any other hard wood that is not easily split.

No. III.

LADLE FOR PAYING THE SEAMS OF SHIPS. IMPROVED PITCH-KETTLE.

The sum of TEN GUINEAS *was this session presented to Mr.* RICHARD SOAPER, *of the Royal Dock-yard, Devonport, for his improved* LADLE FOR PAYING THE SEAMS OF VESSELS WITH PITCH, *and for his improved* PITCH-KETTLE. *Models of each have been placed in the Society's repository.*

IN paying the seams of a ship with pitch (which is done to keep in the oakum with which the seams are stopped) a mop is the instrument commonly made use of. This being dipped into a kettle of hot pitch takes up a certain quantity, and is then rubbed over the seam, care being taken to force in the pitch as accurately as possible. A mop, however, is a very awkward implement for this purpose, being much too large to adapt itself to the seams. Hence a large portion of the pitch requires to be scraped off again, and much falls down on the ground, and is lost. A farther disadvantage is, that the mop presents so large a surface to the air, that in cold weather the greater part of the pitch congeals on its surface, thus occasioning a very serious loss of time.

Mr. Soaper employs, instead of the mop, a ladle with a movable lip, which fits the seams, and thus conveys the pitch into them when boiling hot, and therefore in its state of greatest fluidity. By this contrivance hardly any loss of pitch is incurred, and a great saving of time is also obtained.

In the ordinary way of applying pitch, much falls to the ground, where it gets mixed with chips, shavings, and other impurities; that portion which is scraped from the sides or deck is also in a similar condition, and both are frequently thrown away as useless. Mr. Soaper turns these scraps to good account by connecting a strainer with the ordinary pitch-kettle, which detains the impurities and allows the pitch to drop through.

The above contrivances, though apparently very simple and obvious, appear not to have been introduced into any of our dock-yards previous to the suggestion of Mr. Soaper; and are certainly calculated to save, in that department of public service, much expenditure and still more valuable time.

Reference to the figures of Mr. Soaper's Pitch-ladle and Pitch-kettle.—Plate I.

FIG. 8. *p p* A portion of the side of a ship, *q* a seam to be pitched, *r* a ladle, *s* the spout, *t* a lip joined to the ladle at *v*, under the spout, and open against the ship, *u* a tail or heel-piece to butt against the ladle and prevent its dropping lower than level, *w* an iron apron under the mouth-piece *t*, and flush with the cheeks *x x*, to fit against the ship's side.

Fig. 9. A bird's eye view, having the joint-pin *y* taken

out to separate the ladle from its mouth-piece *t*; *z* the front edge of the mouth-piece bottom, which projects beyond the apron *w* and cheeks *x x*, to enter the seam; *a a* two solid ears to fill up the seam on each side, and prevent the pitch running out; the dotted line *p p* shows the surface of the planks. When the mouth-piece *t* is applied to the seam the ladle is turned on the joint *v* (as shown by the dotted line *r*, fig. 8,) to pour its contents in the mouth-piece *t*, and from thence it runs into the seam.

Fig. 10. *b b* A section of a pitch kettle, *c d* the ordinary lid with its joint; this lid carries another vessel *e e*, the bottom of which is perforated with small holes to serve as a strainer. In this upper vessel is put the pitch which has fallen on chips or dirt, and the pitch as it melts runs through into the kettle, leaving the dirt above the lid of the strainer *f*.

Fig. 11. A bird's eye view. The kettle is drawn on a much smaller scale than the ladle.

No. IV.

GUN-CARRIAGE FOR NAVAL USE, AND JOINTED RAMROD.

The Large Silver Medal was this session presented to Mr. W. Pringle Green, Lieut. R. N., for his Gun-carriage and Jointed Ramrod for Naval use. The following communication has been received from the candidate, and models of his inventions have been placed in the Society's repository.

By the present mode of fighting a cannon on board ship, the apparatus to each consists of two side-tackles, for the purpose of running out the gun after it has been fired and reloaded, a train-tackle, a rammer and sponge attached to one handle, a rammer and worm to a second, a rope rammer and sponge, and a crow-bar and handspike. There is also a ladle to every fourth gun, for the purpose of drawing out the shot when the powder does not ignite owing to the gun being wet, or foul on the inside.

The before-mentioned apparatus lumbers the deck; and by the present mode of working, seven, nine, thirteen, or more men are required to each, according to their calibre: this prohibits the merchant shipping from fighting all their broadside-guns, and from carrying one or more heavy cannon, by which they could in many instances disable the ship chasing them, and thereby escape capture; and when several vessels are in company at sea, or in an exposed harbour, could form a formidable battery, bidding defiance to the attacks of privateers and row-boats.

The sponging and loading a long gun with the present unwieldly staff is both a dangerous and difficult task, and not at the most favourable time to be accomplished without great danger of the men performing that duty being killed or wounded, owing to extending their bodies out of the port-hole to enable them to manage the staff. It is also difficult to load a gun when fighting, on the lee-side of a low vessel, or on the lower deck of a line of battle ship; at such times, should the rammer-head be entered in the gun, and the ship roll, the sponge is unavoidably plunged into the sea, and if the staff escape being broken, it is rendered useless until the sponge is washed and wrung, and the gun is then to be sponged with a wet sponge, which is often a dangerous experiment, nor is there any means to put on a clean one; many staffs are broken, when plunged into the sea, from the velocity of a ship through the water, and many are also dragged out of the men's hands and totally lost.

In running out a gun by the side-tackles, it seldom occurs when it is out, that it points to the object, owing to its not being possible to equalize the exertions of the men at the two tackles, and from the pitching motion of the ship throwing the gun out of its place; the crow-bar and hand-spike are then to be resorted to, to train it, which operation necessarily occupies much time, and often, while performing, the opportunity of firing is altogether lost; much time is also spent in coiling down the side-tackle-falls, which at all times requires great attention, and much caution when the guns are fired, to prevent the men from entangling their legs, by which many, unaccustomed to a battle, are thus wounded, as also by the staffs being thrown about by the falls when they become entangled together.

By my improved mode, two or four men run a gun out of the port-hole, according to its calibre; and in case of emergency, in small vessels, one man can accomplish this. When a gun is running out, the man holding the trigger-line guides it by the handspike, or other lever, at once to the object, and it is by him instantly fired, without the loss of time in coiling down the side-tackles, the necessary attention to the breeching, and to training the gun.

The breeching checks the gun in its recoil, so that no strain is upon either the axle or rope by which it is run out; and that no accident may occur to the mechanism, when the gun is fired, it is so constructed as to be thrown out of gear at that time. If it should be shot away or broken, any person having a hammer, a spare axle and wheels, can complete the whole; and this accident cannot occur unless a shot passes through the sill of the port and breast-piece of the carriage: such a shot is as likely to disable the guns upon the present as the improved plan.

The improved staff answers the purpose of the four now in use; the one made for experiment for a nine-pounder long gun was of five-eights round bar iron, nine feet of which weighed nine pounds: this size, though tapered from the centre to the ends, is sufficient to load a thirty-two pounder; the tapering reduces its weight to seven pounds, but the staff may be hollow from the joint to the screw ends. As regards the weight, it would be immaterial were it twice as heavy as those in present use; because, from its construction, its leverage is so much less. The improved staff is jointed in the centre, and has screw-ends for fixing on the the sponge, the worm, ladle, &c.: this enables the men at every gun to have the whole of their implements at hand without lumbering the decks, and on no occasion to wait one for another, as is now the case; and if loading a gun upon a lower deck or in a low vessel (particularly on the lee-side, when rolling,) the sponge-head, from the staff being jointed in the centre, can be turned upwards, to prevent it from either dipping into the sea, being broken, or forced out of a man's hand, and there being no lever upon the man, he continues the operation of loading, which he could not do at such times with the long wooden staff. Again, should the sponge become foul or wet, a clean one can be put on at pleasure; and if a jointed wooden staff, after the proposed plan, be adopted, very considerable expense will be saved, as any piece of wood will then answer the purpose. By the present mode of warfare, the cartridge is flannel; and if paper be used, a flannel bottom is put to the cartridge, which prevents the necessity of worming so often as was formerly the case; but if any deem it expedient to worm a gun frequently, a spring wadhook may be fitted in the sponge-head, so that the gun will be wormed every time it is loaded.

With the improved staff, the man loading has no necessity at any time to expose his body outside the port-hole, as is now the case, as he can with one hand extended easily perform this operation, which his whole exertion could not at such a time accomplish with the present staff.

The improved staff is considerably shorter than those at present in use,—can be speedily turned under the port outside,—also on the inside under the deck,—is handed in and out of the port-hole with the same pliability and facility as a rope one,—consequently one half the time is gained by this in loading a gun. With one of the improved staffs to each gun, and a few spare ones to each deck, the many now in use will be rendered unnecessary.

Reference to the figures of Lieut. Green's improved Gun-carriage and Ram-rod.—Plate VII.

FIG. 1. A lateral elevation of the cannon mounted on its carriage.

2. A front elevation of ditto.

3. A section of ditto.

4. A bird's-eye view of the carriage, the gun being dismounted.

a The gun.

b Fig. 1. The port-hole.

c c c Fig. 1. The breeching, secured at one end to a strong eye-bolt driven into the ship's side, then passing through one of the loops in the breast rope *d*, through the ring *e* on the side of the carriage, and the loop *f* at the breech of the gun, whence it passes on the other side of the gun through the other carriage ring, through the other loop in the breast rope, and is finally secured to a strong eye-bolt like the former, fixed on the other side of the port-hole.

g Fig. 1, Is an eye-bolt into which is hooked the rope *h*, figs. 1, 2, 3, 4, which passes round the axle *i*, figs. 2, 4, 5: this axle is toothed at each extremity, as shown more plainly fig. 5.

l l Fig. 5. Two pinions fixed on the axle *m* take into the teeth of the axle *i*, and by means of the power of one or two men applied at each of the winches *n n*, figs. 1, 5, and 4, wind up the rope *h*, and thus bring the gun to the mouth of the port. When this has been done, the axle *m* is to be thrown out of gear by being raised from the bottom of the curved hole *m*, figs. 1 and 3, to the upper extremity of the same, and the winches are to be taken off. The gun being then fixed, unwinds in its recoil the rope on the axle *i*, and is finally stopped by the resistance of the breeching; the winches are then fixed on the axle *m*, and the axle is again brought into gear in readiness for winding the gun to the mouth of the port as soon as it has again been charged.

Fig. 6. A jointed rammer made of wood or of bar iron, either hollow or solid. The ends *o* and *q* may be unscrewed and replaced by the screw *r*, or the scoop *p*.

No. V.

IMPROVED METHOD OF LETTING GO THE ANCHOR.

The LARGE SILVER MEDAL was this session presented to G. G. BURTON, Esq., Capt. R. N., for his improved method of LETTING GO THE ANCHOR. The following letters have been received from Capt. Burton on the subject; and a model of his apparatus has been placed in the Society's repository.

SIR, Sandwich, Kent, April 21, 1823.

I BEG you will be good enough to lay before the Society for its inspection, a plan for more easily and expeditiously letting go an anchor; it will equally apply to the merchant service as well as to his majesty's navy. If the plan shall appear to possess the qualifications pointed out, I shall be happy to receive the Society's approbation of it, and will wait on any committee upon notice of its convenience to take up the subject, begging of you to give me the earliest notice of the appointed day as it will require me to proceed hence.

I am, Sir,
&c. &c. &c.
G. G. BURTON.

A. Aikin, Esq.
Secretary, &c. &c.

Sir, Sandwich, July 24, 1824.

For a description of the accompanying model, I beg to refer you to the plan already before the Society, which clearly points out its mode of application; but I add the following remarks to show the advantages resulting from its application, which are principally five, viz.

First, it ensures the anchor being let go at the instant it is required, which is not always the case with the old method, as the turns are apt to jam, when it becomes necessary to cut them, and even this requires time, which may prevent you taking a precise birth in a confined anchorage, or anchoring in line. And an anchor being *instantly* let go will sometimes prevent one ship running on board another; and there being no rackings to cut, or turns to take off, (on any sudden emergency in the night), the anchor may be let go at a moment's notice.

Secondly, economy of strength,—as but one man is required to each stopper *for the largest anchor*, indeed a boy is sufficient for the shank painter, and they are quite out of the way.

Thirdly, safety,—as by the old method of letting go the running end, if the men were not very active to get out of the way in time, the loss of life or limb might be the consequence; and the the hammock nettings are constantly broken by the violent action of the end of the stoppers; neither of which accidents can possibly occur by the proposed plan.

Fourthly, room. By the old method the stoppers are led across the forecastle, nearly occupying one side; now it is known to all seamen that there are more ropes led to the forecastle than to any other part of the ship, particularly when coming to an anchor, directly across most of which the stoppers are led, which creates much disorder, and risk of the people's getting in the way of the stoppers when their personal safety depends on being clear of them. By the proposed plan the two men are placed quite out of the way of working the ship, and, as there are no rackings to cut or turns to take off, they need not go to their posts until the order is given to stand by the anchor, although the order for letting go may follow in a few seconds; and in coming to an anchor during action the anchors may be let go without for one moment interfering with the forecastle guns.

Fifthly, time. In stowing the anchors, considerable time is saved by passing the standing part of the stopper, which enables you to have your jiggers on for bousing the first turn taught before hand; and, lastly, (if it is an advantage), you may let go which end of the stopper you please, as the application of my plan does not prevent the stoppers being used in the old way.

It has been tried on board several of his majesty's ships, and has proved its usefulness to the full extent of my expectation.

I am, Sir,
&c. &c. &c.
G. G. BURTON.

A. Aikin, Esq.
Secretary, &c. &c.

SIR, Sandwich, April 28, 1823.

I HAVE the honour to enclose to you two letters, from Sir Robert Mends and Captain Warren, touching the merits of my invention for letting go an anchor, which I will thank you to lay before the committee, with the letter from

Sir Edward Codrington I left in your hands, when my plans come under their consideration.

I am, Sir,
&c. &c. &c.

A. Aikin, Esq.
Secretary, &c. &c.

G. G. Burton.

Sir, Charles-street, Berkley-square, July 27.

Many thanks for the plan you have been good enough to send me of your improved method of letting go an anchor. I certainly think very highly of it, and am glad to find it is approved of, after practical experiment, by so good a judge as Captain Warren. I shall place the plan, with your letter, in the R. N. club-room in Albemarle-street, where it will meet the examination of many of our brother officers, and I have no doubt be equally approved of by them.

I am, Sir,
&c. &c. &c.

Captain G. Burton.

Edw. Codrington.

Sir, Owen Glendower, Chatham, Nov. 12, 1822.

Unintentionally your letter has remained a good while unanswered, having slipt on one side amongst a mass of papers, and escaped my recollection, which will I hope plead my apology. Having myself witnessed the facility with which the anchor is let go on your plan, and taken the opinion of the lieutenants, master, and boatswain, who all agree with me, I have no hesitation in pronouncing it a great improvement on the old method, and far superior to any other I have seen, as no chance of accident or injury can arise to the man who lets it go.

I am, Sir,
&c. &c. &c.

Captain G. Burton. R. Mends.

Sir, Seringapatam, at the Nore, April 26, 1823.

It is right, after upwards of two years' trial of your plan for letting an anchor go by the standing parts of the stopper and shank-painter, I should state to you, the opinion of myself and the officers of the ship, of its merits, viz. it has never failed to run; the men that are stationed to let the anchor go, are not exposed to danger, nor are they in the way of shortening sail as they were on the old plan; the anchor drops from the bows without the tremulous motion that the running part of the stopper and shank-painter gave her; besides, in stowing the anchor after it is coiled, you have merely the standing part of the stopper to pass through the ring, and bouse the first turn taught instead of having the long end to haul round. I hope when all these advantages are known, it will be generally adopted in the service.

I am, Sir,
&c. &c. &c.

Captain G. Burton, R. N.
Sandwich. Saml. Warren.

In order to secure a ship's anchor, which, by the usual means, has been brought to the surface of the water, a hook fixed to a tackle, passing over the pullies in the projecting beam called the cat-head, is placed in the ring of the anchor. An adequate power being applied to this tackle, the anchor is raised above the hawse-holes, and is finally suspended from the side of the cat-head by means of a short rope called a stopper, one end of which being made *fast*, the other is put through the anchor ring, and is secured by three or four turns round one of the timber heads. A rope or chain, called the shank-painter, is also fastened to the shank of the anchor, by means of which the anchor is drawn into an oblique position, and is thus secured to the *bow* of the ship.

In preparing to anchor, the shank-painter is *cast off*, and then the anchor remains suspended in a vertical position from the cat-head by means of the stopper; when the order is given to let go, the turns made by the running end of the stopper round the timber head are slackened, and the stopper being cautiously cast off, the anchor drops down, carrying the cable with it. But to cast off the stopper is by no means an easy operation; for the whole weight of the anchor being borne by it, the services of several men are required, and these, being sometimes overpowered, the running end gets loose, entangling the legs of the men and occasioning very serious accidents: sometimes also the turns round the timber head get foul, and the anchor cannot be released without cutting the stopper.

For the above-mentioned reasons Captain Burton has invented a mode of casting off the stopper, which is represented in plate VIII., in which fig. 1 is a lateral view, fig. 2 a front view, and fig. 4 a bird's-eye view of the apparatus with the anchor suspended by it. *a a* Is the ship's side, *b* the cat-head, *c* the stopper, which passing through the ring *d* of the anchor keeps it a vertical position previous to letting it go: *e* is the stock and *f* the shank of the anchor. That end of the stopper which is represented as taking three or four turns round the timber head in the side of the ship, is the running end according to the usual mode of casting it off, but is the fast end on Captain Burton's plan. Now, tracing the stopper from this fast end, fig. 1, we find that it first passes in a horizontal direction to a shoulder or cleat, bolted to the side of the cat-head, thence it descends forming a loop through the ring of the anchor, and afterwards ascending on the other side of the cat-head, it terminates in an eye which is slipped on the short end of a trip bolt, as shown in fig. 2, being prevented from slipping off by means of a staple passed through the bolt between its extremities and the eye of the stopper. The bolt is fixed on a pivot which allows it a certain quantity of motion up and down, and its long end is cut off obliquely downwards: this end is received into a shallow cavity at the end of a jointed clasp *g*, fig. 1, (the right hand *g* in figs. 2 and 3, and the lower *g* in fig. 4) and the clasp is secured in its place by means of a horizontal clasp and pin, as represented fig. 1.

In order to prepare for letting go, the end of the handspike fig. 5, is to be introduced into the iron loop or staple driven into the cat-head by the side of the clasp *g*, figs. 1 and 4, by which means it answers the purpose of the horizontal clasp, and thus allows this to be loosened by taking out its pin: the pin at the short end of the trip-bolt is also to be withdrawn. On the order "let go" being given, nothing more is required than to pull the end of the handspike out of the staple, the clasp *g* is then thrown back as the long or lever end of the trip bolt rises: the short end of the bolt being proportionably depressed, the eye of the stopper slips

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off, and thus releases the anchor without any trouble or possibility of accident.

A further advantage attends Captain Burton's plan, namely, that if circumstances should on any occasion render it expedient to cast off the stopper by that end which is put round the timber head, as usual, this may be done; for the trip-bolt, while the clasps and pins remain in their places, forms a perfect method of securing the looped end of the stopper.

Captain Burton has also adopted a smilar mode of securing the shank painter. In fig. 6, *a a* represents the ship's side, *b* the shank painter, the terminal link of which is received in a hole cut through the bulwarks, and is secured on the inside by the trip-bolt *g*; this, like the other trip-bolt already mentioned, is a lever moveable on a *fulcrum* or pin, and its upper end, which is cut off obliquely, is received into a sloped cavity in the under side of a clasp, which clasp also moves on a pin having its motion limited by the aperture in the bulwarks in which it is inserted. It is obvious that when the clasp is let down on the head of the bolt and a wedge is inserted above the clasp so as to fill up the hole in which it works, the bolt remains *immovable* and consequently the chain *b* is perfectly secured: this state of things is shown in fig. 6. On withdrawing the wedge, as shown in fig. 7, the pressure of the chain on the bolt causes it to move on its pin and consequently disengages it from the clasp, throwing the upper end forwards and the lower end backwards, and thus allowing the end link of the chain to slip off the lower end of the bolt. *Fig.* 8, is a front view from the inside of the ship of the apparatus in the same position as represented in fig. 6.

No. VI.

BALANCED MASTS.

The sum of TWENTY GUINEAS *was this session presented to Mr.* RAPHAEL CLINT *of London, for his* BALANCED *or* SWINGING MASTS, *applied to sailing-boats and other light vessels. The following communication has been received from him on the subject; and a model of the invention has been placed in the Society's repository.*

THE inventor has for some years past been connected with nautical science, as a pursuit of pleasure, mostly on the boisterous west coast of Scotland; and he is fully aware of all the vicissitudes to which vessels are exposed, and has a correct knowledge of their tactics.

This invention, now offered to the Society of Arts, &c., was originally intended for open boats; but, on trial, it appeared that, under the various modifications of which it is susceptible, it may be most advantageously adopted for decked vessels, being particularly well adapted to the use of such of them as are employed only for fast sailing, without regard to the carrying of cargoes. Of this class are revenue-cutters, mail-packets, pilot-boats, pleasure-boats, and others; and when the many important advantages resulting from the invention shall become known, none of these will refuse to make the allowance of the space required for the cradle, which will be about the same as that occupied by the engines of a steam-boat. One of the objects of this plan is to enable a vessel under a press of sail, *close hauled*, to preserve an upright position upon the water. The advantages of which position are,— 1, The vessel will sail faster by dividing the water better at the bows, and by drawing less dead water at the stern. 2, The vessel will answer the helm much better. 3, The vessel will go better to windward in that position than in the awkward state of sailing upon her side. Another object is to prevent the loss of lives and property consequent upon the frequent upsetting of vessels in squalls of wind, or by inattention or fool-hardiness; for a vessel on this construction is found on trial to maintain her upright position, however violent the wind.

The model before the Society is that of a sailing vessel, six feet long, and only *nine inches broad*; of which the following is a brief description. In her hold, a semicircular cradle is suspended on the centres between two beams; in this cradle is placed a quantity of ballast, or part of cargo; in the cradle the mast is raised, and to the sides of it are fixed all the rigging, haul-yards, &c., the whole being decked in: in other respects there is no material difference above deck from ordinary vessels. A boat on this construction is enabled to carry nearly three times the common quantity of sail *close hauled*, and from its great length of shape sails with proportionably increased velocity; and however violent the pressure of the wind, the *hull* of the vessel always maintains an upright position in the water.

The preceding remarks have reference only to the application of this principle to vessels of the ordinary form; but a more important advantage, as far as relates to fast sailing, results from this construction, consisting in the diminished breadth of the vessel. The proportion of length to breadth in the model before the Society is as seven to one, and the ordinary proportion is as three to one, by which four-sevenths less of resistance is given to the progress of this vessel through the water, giving her four-sevenths of accelerated velocity in sailing.

Length, if it can be applied, is a great desideratum: it enables a vessel to go over a heavy sea with ease and speed, by making the angles of elevation and depression upon the waves less accute: it makes a vessel sail more steadily, and hold a good wind: it enables a vessel to lie at anchor and ride out a gale in greater safety, by diminishing the strain upon the cable.

To all these advantages the plan has the merit of extreme simplicity. Every stay, haul-yard, brace, sheet, tackle, and sail, is in the same place as in an ordinary vessel; and consequently, in manning a vessel on this principle for sea, the sailors would have *nothing new to learn.*

In conclusion, it may not be impertinent to remind the Society of the various means adopted by the natives of the shores of the Pacific and Indian oceans to make their long canoes carry sail.

There are the double canoe, the catamaran, the canoe with bamboo canes placed out upon cross poles, and the canoe with one side flat and a man out to windward upon a spar: these serve to exemplify the utility of length, but are fit only for an amphibious people, and are practicable only on a small scale.—See *Lord Anson's description of the Flying Proas of the Ladrone Islands.*

RAPHAEL CLINT.

In the month of May last a whale-boat was fitted up by Mr. Clint according to the above plan, and several experiments were made on her in the river Thames: on one occasion she sailed down to Erith with a full spread of canvas, and upon nearly an even keel, at a time when, from the boisterousness of the wind, the Gravesend and other sailing boats were working under reefed sails, and running nearly gunwale to. Of the novelty of Mr. Clint's plan, and its practicability to at least a certain extent, there appears no doubt; and therefore the Society have thought themselves justified in offering it to the attention of the public, without, however, pledging themselves that in its present state it is applicable safely and usefully to marine navigation.

Reference to the figures.—Plate IX.

Fig. 4 represents the relative position of the mast and hull before sail is set.

Fig 3 represents the same when the vessel is under a press of sail close hauled.

a The hull.

b The mast attached to the cradle *c*: the lower part of the cradle is partitioned off to contain the ballast.

d One of the pivots by means of which the mast and cradle are suspended, allowing them to swing laterally while the hull preserves its upright position.

No. VII.

NEW MODE OF SUPPORTING TOPMASTS.

The Gold Vulcan Medal was this session presented to Mr. G. Smart of Pedlars'-acre, Lambeth, for his new mode of supporting the Topmasts of Ships. A model of his invention has been placed in the Society's repository.

The common mode of supporting a topmast is by means of a fid, or bolt, of iron or wood, which passes transversely through the mast near its base, and rests, by its two ends, on the tressel-trees, which form part of the top or framework of timber, which, together with the cap at the head of the lower mast, (through which, also, the topmast passes,) supports this latter in a vertical position. It is also supported laterally, in two opposite directions, by the shrouds, which are strong ropes fixed at their lower end, some to the side of the vessel and some to the top of the lower mast, and all of them secured, at their upper end, to the head of the topmast.

In heavy gales, when a vessel is under way, or at anchor, the impulse of the wind against the mast is such that it acts like a power applied at the end of a very long lever to bury the lee side of the hull in the sea. The obvious remedy for this would be to lower or slide down the topmast, and thus to reduce the length of the lever; and, to a person unacquainted with practical navigation, the only operation apparently requisite for this purpose would be to

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knock out the fid and then to lower the topmast through the interval between the two tressel-trees.

The weight, however, of the topmast, with all its appendages, occasions so enormous a pressure on the fid that it is found quite impossible, by any power which can in that situation be applied, to drive out or withdraw the fid without previously taking off the pressure. This is done, or rather attempted to be done, by attaching a rope to the heel of the topmast, leading it through a block hooked on to the cap of the lower mast, and then conveying it below to the windlass or any other power that can be most conveniently made use of. But as in gales of wind the shrouds are always drenched with wet from the spray and the rain, and as a dry rope alway shortens by being wetted, it follows that the tension of the topmast shrouds is at such times acting in the same direction as the weight of the topmast, and in direct opposition to the heel rope, on which account it rarely happens that the fid can be relieved.

The tension of the shrouds may indeed be taken off by slackening them; but, in proportion as this is done, the lateral support of the topmast is diminished, and the most imminent hazard is incurred of its being blown away. To lower the topmasts therefore, while a ship is under way, however conducive it may be to the ease and even to the safety of the vessel, is a manœuvre not often successfully attempted even on board men of war, and scarcely ever on board merchant-men, which are always scantily manned.

The above-mentioned very serious objections to the common way of securing a topmast have induced Mr. Smart to propose the following plan, which, although as yet it wants the sanction of experiment, has been taken into consideration at two successive committees; and from its there obtaining the unanimous approval of naval officers and other professional men, is now offered to the public through the medium of the Society.

A little below the *hounds*, or shoulder of the lower mast, which supports the framework of the top, is to be formed a step *f*, (fig. 2, plate IX.) This may be done by bolting a fish to the mast in that part, if the mast is a single tree; but if built of several spars, as all large lower masts are, there will be no difficulty in making the step without the use of a fish. The face of the step is to be a plane declining outwards, and is to be strongly plated with iron or copper. A shoulder fitted to this step, and like it covered with metal plate, is to be cut in the heel of the topmast *b*: the whole weight of the topmast will therefore rest on and be supported by the step in the lower mast, and as the area of the step will be at least equal to that of the top of the fid-hole *h*, the one will be no more liable to crush in by the superincumbent weight than the other. In order to prevent the top-mast from being thrown off its step by any lateral motion, a wedge *g*, figs. 1 and 2, is driven between the top-mast and the cross tree *e*. The fid *h* is proposed to be retained, but only as a preventer in case of accident; for the bottom of the fid-hole being placed an inch above the tressel-tree *d d*, it is manifest that it bears no part of the weight of the top-mast as long as this latter rests on the step *f*.

In order to strike or lower the top-mast, the heel rope, with its tackle, is first to be applied, then the fid *h* is to be withdrawn, after which the wedge *g* is to be knocked out, and this will be done with comparatively little difficulty because the lateral pressure of the mast cannot be much, and because any difficulty likely to arise from this cause may be obviated by proportionally increasing the angle of the wedge. Nothing now remains but the exertions of two or three men with handspikes inserted between the two masts near the tressel-trees, to trip the top-mast off the sloping step *f*, and to lower it in the usual way by means of the heel-rope.

References to the engraving.—Plate IX.

FIG. 1 is an elevation.
Fig. 2 is a section.
a The upper part of the lower mast.
b The lower part of the top-mast.
c The cap.
d d One of the tressel-trees.
e e The cross-trees.
f The step on which the top-mast is supported.
g The wedge by which the top-mast is secured in its place.
h The preventer fid.

No. VIII.

IMPROVED SCREEN GLASSES FOR QUADRANTS AND SEXTANTS.

The Gold Vulcan Medal *was this session presented to Mr. W. J. T.* Hood, *Lieut. R. N., for his improved* Screen-glasses for Quadrants and Sextants *intended for use on board ship. The following communication has been received from the candidate, and a model of his invention has been placed in the Society's repository.*

Sir, No. 9, Upper Thames-street, April 9, 1824.

Having observed at sea that one of the most important objects, that of finding a ship's latitude by observation with the common sextant and quadrant, is very frequently rendered uncertain, and even the opportunity altogether lost, from the circumstance of the observer being obliged (when the clouds in hazy weather are passing fast by the sun) to take the instrument from the eye for the purpose of shifting the screen glasses, when a change of shade is necessary; I have to beg you will be pleased to lay before the Society of Arts the model of a quadrant I have caused to be fitted with axles, which are equally applicable to the sextant, for the purpose of obviating this difficulty, and thereby insuring greater security to the ships and lives of our navigators.

To the fore limb of the instrument is attached a wire axle, with two revolving tubes over it, serving each as a distinct axle and lever to the screens; so, that when the instrument is held with either hand, perfect command of the screens is retained by the three fore fingers.

I am, Sir,
&c. &c. &c.
A. Aikin, Esq.
Secretary, &c. &c.
W. J. T. Hood, *Lieut. R.N.*

CERTIFICATES.

The following letters are subjoined as being from persons well qualified to judge of the probable utility of Lieut. Hood's invention.

Dear Sir, Woolwich, May 9, 1824.

Lieut. Hood having shown me the model of his improved sextant, and having expressed a wish that I would state my opinion to you of the merits of the construction. I beg to say, that I conceive there will be great practical convenience in being able to change the shades without moving the instrument from the eye; and that I am not aware of any practical objection that can be made to the adoption of the means recommended by Lieut. Hood, which appear to me to be very simple, and deserving the encouragement of the Society of Arts. I have frequently experienced great inconvenience, in light cloudy weather, by having to change the shades backwards and forwards as different clouds intervene.

I am, Sir,
&c. &c. &c.
A. Aikin, Esq.
Secretary, &c. &c.
P. Barlow.

Dear Sir, Cheltenham, May 9, 1824.

In reply to your letter, requesting my opinion on the improvement you have lately invented on the quadrant, I have no hesitation in saying, that I consider it not only a very *ingenious* but most *useful* one also, as it must greatly tend to facilitate astronomical observations at sea, particularly in thick and cloudy weather; and I hope will be generally adopted, as there can be no doubt, in my opinion, of its being an improvement of great utility, and not a little consequence.

I am, Sir,
&c. &c. &c.
S. H. Inglefield, *Capt. R. N.*

Lieut. W. J. T. Hood, R.N.

From Vice-Admiral Sir B. Hallowell, K.C.B., commander-in-chief at Chatham.

Dear Sir, Chatham, May 12, 1824.

I have seen your improvement on the sextant and quadrant, and have no doubt of the great advantage that will be derived from it in obtaining the altitude of the sun at sea in cloudy weather.

I am, Sir,
&c. &c. &c.

Lieut. Hood, R. N. Ben. Hallowell.

FROM Thomas Young, Esq. M.D., Secretary to the Board of Longitude.

SIR, Admiralty, April 3, 1824.

I AM directed to return you the thanks of the Board of Longitude for the exhibition of your improved sextant, which was examined at the meeting of the Board on Thursday last, and to express their approbation of your invention.

I am, Sir,
&c. &c. &c.
THOS. YOUNG, M. D.
Secretary to the Board of Longitude.

Lieut. Hood, R. N.

SIR, 62, Charing-cross, May 10, 1824.

IN compliance with your wishes respecting my opinion of your improvement in the arrangement of the dark glasses for quadrants, I beg to observe, that your invention is new, useful, and expeditious. Its simplicity is such as not to interfere with the other parts of the instrument, and *its* expedition in changing the glasses is such that, by its means, observations may frequently be obtained in cloudy weather, which could not be accomplished by the common or usual quadrant, on account of the time required in shifting the shades.

I am, Sir,
&c. &c. &c.

Lieut. Hood, R.N. THOS. JONES.

Sɪʀ, Leadenhall-street, May 8, 1824.

In answer to your favour, accompanying the quadrant to which you have attached a new method of changing the screens, I beg leave to state, as my opinion thereof, that, with a very little practice in its use, I consider it may be very advantageous in the obtainment of altitudes of the sun, when from the interposition of clouds, there is a necessity for changing the screens frequently: that your method provides for this without the necessity of taking the attention of the eye from its object, which is still more important in cases of altitudes for the attainment of the apparent time and latitude, both by double altitudes and that of the sun on the meridian, which are not unfrequently lost for the want of such convenience, which might be attended with serious consequences to the navigator.

I am, Sir,
&c. &c. &c.

Lieut. Hood, R. N. Tʜᴏs. Lʏɴɴ.

Sɪʀ, Leadenhall-street, April 20, 1824.

As you require our opinion on the utility of your improved method of shifting the screen-glasses of the sextant or quadrant, we beg to say that we think it likely to become generally useful, and not in any way injurious to the frame of the instrument.

We are, Sir,
&c. &c. &c.

Lieut. Hood, R. N. Wᴍ. & T. Gɪʟʙᴇʀᴛ.

Reference to the engraving of Lieut. Hood's Quadrant for naval use.—Plate X.

FIG. 1 is a front, and fig. 2 a side view of the quadrant: the same letters refer to the same parts in each figure.

The quadrant is made in the usual way, with the exception of the fittings up of the screen-glasses. The uppermost screen *a* is fixed on a wire-axle *b c*; at each end of the axle is a pivot *b c*; the pivot *b* turns in a hole in a boss *d*, which is fixed to the upper end of the instrument: the lower pivot *c* turns in a hole near to the end, and in the upper side of the arch. On the lower part of the axle is fixed a boss or roller *e*, made of hard wood, and turned a little hollow in the middle, so as to feel easy to the finger; the middle screen *f* is fixed on the upper end of a brass tube or hollow axle *g*, through which the axle *b c* passes, and is at liberty to turn freely within it; on the lower end of the axle *g* is fixed a brass or roller *h*, similar to the boss *e*, as before described; the lowest screen *i* is also fixed on the upper end of another brass tube or hollow axle *j*, through which the axle *a b* and the tube *g* pass; and all of them are at liberty to turn freely within or upon one another; on the lower end of the axle *j* is fixed a boss or roller *k*, similar to those of *e* and *h*, and which must be at proper distances from each other, so as to coincide with the three first fingers of either hand; consequently, when the instrument is held up, a perfect command of the screens is retained by the fingers, without removing the instrument from the eye, when a change of shade is necessary.

Fig. 3 is a section of the screen-glasses, axles, &c., and fig. 4 is a view of the under side of one of the screen-glases.

The two last figures are drawn to a scale of double the size of figs. 1 and 2.

No. IX.

SCREW-WRENCH.

The sum of TEN GUINEAS *was this session presented to Mr.* FR. WATT, *for his* SCREW-WRENCH; *a model of which has been placed in the Society's repository.*

SIR, Pedlars' Acre, Lambeth, April 21, 1823.

I HEREWITH send you a model of a screw-wrench, the invention of Mr. Francis Watt, engineer. He is not expected to live many days, and has sent it to me requesting my acceptance of it, in gratitude for some little attentions I have shown him formerly; conceiving it the best wrench that I have seen, if the Society should think it merits a reward, I shall have great pleasure in handing the same to the sick man, or his widow.

I am, Sir,
&c. &c. &c.
GEO. SMART.

A. Aikin, Esq.
Secretary, &c. &c.

Mr. Watt died on the very day that his invention was brought before the committee, and the reward was consequently bestowed on his widow.

The screw-wrench is a kind of lever-vice, and is an extremely convenient tool for securing and loosening square headed screws, and for other similar purposes. The movable chap of the instrument is secured at any required distance from the fixed one, sometimes by means of a screw, and sometimes by means of a short wedge driven in at the base of the sliding bar. To both these methods, however, as usually applied, there are objections arising from the liability of the former to be injured, and of the latter to give way under the great strain which is sometimes put upon the instrument.

Mr. Watt's wrench is represented plate XI., fig. 7. *i i* Is the fixed bar terminated by the fixed chap *h*, *j j j* is an iron case inclosing and fixed firmly on the bar *i i*, *k* is the sliding chap, having a hole cut in it for the bar *i i* to pass through, and secured to the sliding bar *l l*. It will be observed that the lower end of this bar is cut off very obliquely, so as to form a long low wedge.

m n Is a low wedge, still longer than that just described.

In order to make use of the instrument, the wedge *m n* is to be withdrawn, the chap *k* is to be moved on the bar *i i*, till the screw head, or other object to be acted on, is closely embraced between twe two chaps; the movable wedge is then to be inserted point foremost, and is to be driven home by a light blow or two of a hammer, or may be forced in sufficiently even by hand.

The long line of bearing that the two wedges have on each other renders it impossible that they should give way, while, at the same time, a very moderate blow on the point of the movable wedge will be sufficient to disengage it.

It is by no means absolutely necessary to take out the movable wedge previous to adjusting the instrument; all that is required being that the sliding bar *l l* should move easily.

It will therefore be found convenient to drill a hole through the point of the wedge at *m*, and insert a small pin, in order to prevent the wedge from slipping out of the case *j j*, and being lost.

No. X.

SCREW-WRENCH.

The Silver Vulcan Medal was this session presented to Mr. Thomas Eddy, 354, Oxford-street, for a Screw-wrench. The following communication has been received from the candidate; and a model of the wrench has been placed in the Society's repository.

Sir, 354, Oxford-street, March 17, 1824.

I beg you will lay before the Society for the encouragement of Arts, Manufactures, and Commerce, a screw-wrench of my invention.

It is actuated by a screw as that is which is in common use, but differs from this latter in the screw being introduced into the sliding part instead of into the handle. By this arrangement the instrument is rendered much stronger, and is not liable to open and shut by the turn of the hand while using it, as is the case with the common one.

In manufactories where the work is heavy the common wrench is often breaking in the screw, an accident which cannot occur with the new one, as the strain is not on that part which contains the screw. It may be made at nearly the same expense as the one in common use.

I am, Sir,
&c. &c. &c.
Thos. Eddy.

A. Aikin, Esq.
Secretary, &c. &c.

Reference to the engraving of Mr. Eddy's Screw-wrench. Plate X.

FIG. 5 is a side view.
Fig. 7 is an edge view.
Fig. 6 is a longitudinal section.

(The same letters refer to the same parts in all the figures.)

a Is the fixed chap, *b* is the fixed bar, *c* is the movable chap which passes through and slides upon the bar *b*, *d* the movable bar fixed to the chap *c*. This bar has a hollow barrel, screwed at its orifice, in which the solid thumb-screw *f* works.

At the extremity of the bar *b* is formed a shoulder, on which rests the square piece *g*; or the bar may be turned up at right angles forming a short projecting leg, which will answer the purpose of the piece *g*, and will be both stronger and cheaper. A square hole is to be made in *g* to admit the screw *f*, and this hole is to be contracted in one part by the insertion of two square pins *i* and *h*, which confine the neck of the screw so as to allow it to turn round, but not to move backwards or forwards: *e* is a plate of iron wrapped round the end of the instrument in order to keep the parts in their proper places, and to prevent the screws from being choaked with dirt.

Hence it is obvious, that when the screw *f* is turned in one direction, the barrel *d*, with the chap *e*, is pushed towards the chap *a*, and that it is withdrawn when the screw is turned in the opposite direction.

No. XI.

QUADRUPLE LOCK.

The SILVER VULCAN MEDAL *and* TEN GUINEAS *were this session presented to Mr. J.* DUCE *of Wolverhampton, for his* QUADRUPLE LOCK FOR SAFE CHESTS, *&c. The following communication was received from Mr. Duce on the subject; and the lock has been placed in the Society's repository.*

SIR, Wolverhampton, May 17, 1823.

I WILL thank you to lay before the Society of Arts a lock of my invention. It is intended for the purpose of securing iron safes and chests. With a single turn of the key it throws out four bolts, one at right angles to each side of the lock; and will, therefore, prevent any door to which it is applied from being opened, even if the hinges have been cut away. If to this be added the great difficulty (probably the impossibility) of picking it, the security offered by it is as great as can be effected or desired.

I am, Sir,
&c. &c. &c.
JOSEPH DUCE.

A. Aikin, Esq.
Secretary, &c. &c.

Locks for safes, which throw out three bolts at once, have been made by various persons, but such locks are only single ones, with the modification of having three bolts instead of one. A lock, therefore, of this description offers no more difficulties in the way of picking it than are presented by a single-bolt lock of the same construction.

Mr. Duce's lock, however, is a combination of four distinct single-bolt locks, fixed in the same frame and opened by the same key; the bolts, therefore, are shut or withdrawn in succession, and present the two following advantages. Whatever time and trouble may be required for picking one of the locks must be quadrupled before the whole can be opened; and as the key opens the four locks in succession, the strain on the wards will be much less than in those cases where two or more bolts are moved simultaneously.

Independently of the ingenious manner in which the four locks are combined, there is not much of novelty in the invention. The tumblers are on Chubb's principle, without the detector, and the rest of the lock is on Barron's principle.

Reference to the engraving of Mr. Duce's Lock.—Plate XI.

FIG. 8. *o o* The case, *p p* the first bolt, *q q* the second, *r r* the third, and *s s* the fourth bolt; the upper plate is removed, and the lock rests on the inner casing *t t t t*; *u u u u* an inner plate, *v v v* three tumblers lying on it for the three first bolts; beneath each of these tumblers, and under the plate *u u*, are two more tumblers, making three for each of these bolts; the last bolt *s s* has but one tumbler *w*, placed under the plate *u u*, which is moved by the corners of an intermediate piece *x x*, which turns on the pin *y*, as is shown by dotted lines: the key *z* is represented as having thrown out the first bolt *p*, and beginning to protrude the second *q*; it then acts on the bolt *r*, and lastly on the bolt *s*, moving them to places shown by dotted lines. It withdraws the three first bolts in a reverse order, but finishes with the last *s s*, in either case.

Fig. 9. The key.

No. XII.

ORIGINAL SCREW.

The SILVER VULCAN MEDAL and TEN GUINEAS were this session presented to Mr. G. WALSH of Mount-street, Walworth Common, for AN ORIGINAL SCREW. The screw and other parts of apparatus mentioned in the following description have been placed in the Society's repository.

THE Society have for some few years offered a premium for a method for generating an original screw more perfect than any hitherto known. Several claimants have come forward; but the Society have not as yet thought themselves justified in awarding the premium, on account of the actual imperfections of the screws produced, and the inadequacy of the means employed to obtain a correct result. The screw made by Mr. Welsh, when examined by a micrometer, appears to be erroneous to the amount of no more than 1-250 of an inch in thirty-four threads; and, therefore, though not fit for astronomical purposes may however be very advantageously applied to other uses. The ingenious simplicity of the apparatus by which it was made, not requiring the use of a screw engine with guide screw, wheel work, slide rest, &c. is also a circumstance worthy of notice, as offering to the artisan of adequate skill but contracted pecuniary means facilities of good work which hitherto have not been in his power.

In plate XI., fig. 1, *a a* represents a cylinder of softened steel, which is to be cut into a screw.

The first step is to turn a short cylinder of soft steel exactly twice the diameter of the intended screw. This is then to be fitted on an arbor in the lathe, and, by means of a common screw-tool of the required number of teeth, is to be cut into a double threaded screw, and is then to be hardened: of this latter screw, *b b* fig. 2 represents a lateral and a front view.

Another short cylinder of soft steel is then to be made of exactly the diameter of the intended screw; it is then to be fitted on a pin and put into the frame *d d* fig. 1; in this situation it is to be pressed hard against the cylinder *b*, fig. 2, while revolving in the lathe, until a good thread is raised on its surface. The thread thus formed will be a single thread, though taken from a double one, because during the process it revolves in proportion to the larger cylinder as two to one; it will also be a left-handed thread, because taken by impression from a right-handed one. After a few revolutions of the cylinder *c*, the frame in which it is held is to be turned upside down and the same number of revolutions are to be made with the frame in this position, by which alternation the thread will be kept quite perpendicular to its axis, and the more the two cylinders are worked together, the more will the cylinder *c* be free from the errors of the first cylinder *b*. Being completed, it is then to be hardened, and is again to be put into the frame *d d*. The cylinder *a a* being put into a lathe, the screw *c c* is to be pressed hard against it in the manner of a milling tool, beginning on the right hand: when it has made a sufficient impression or lead, it is to be shifted one thread towards the left hand, the following threads of the screw always working in the preceding impression which serves as their guide; this is to be continued till the whole cylinder is impressed with the lead of a screw, (as shown fig. 1.) which will of course be right-handed, because the impressing screw is left-handed. The lead thus obtained is to be eased or cut deeper by the pointed tool *e e*, and is then to be finished by the screw *c*, taking care, as before directed, to reverse the frame *d d* from time to time.

To make a left-handed screw to suit a given right-handed one, tap a cylinder of steel in the same dies, and of the same diameter as the given screw, and turn each end down to a pivot, as *f f*, fig. 4, and harden it; drop it in the open frame *g g*, fig. 5, (fig. 6 is an end view of the same), and work it hard against the prepared cylinder exactly as described above for the original screw, by which a left-handed lead will be obtained, which is to be deepened with the point tool and finished by the roller *f f* as before.

When this screw is obtained it may be hardened, and left-handed dies may be made from it.

No. XIII.

STEAM CULINARY APPARATUS.

The SILVER VULCAN MEDAL *was this session presented to Captain T. M.* BAGNOLD, *R. M., for an improvement in the* STEAM CULINARY APPARATUS. *The following communication has been received from Captain Bagnold; and a model of his apparatus has been placed in the Society's repository.*

SIR,

HEREWITH I transmit, for the opinion of the Society, a model of an improved steam kettle, which I will thank you to lay before them. I have had it in use for upwards of a year, and the principle has been adopted by a friend, in both cases with the most complete success.

I am, Sir,
&c. &c. &c.
T. M. BAGNOLD.

A. Aikin, Esq.
Secretary, &c. &c.

Whilst the great facility, cleanliness, and economy obtained by the application of steam to culinary purposes have been long universally acknowledged, its adoption in private families has been greatly retarded, if not prevented, by the disagreeable effects of the vapour escaping from between the lid and body of the steam kettle employed. Attempts have been made to proportion the supply to the demand, by regulating the cocks; but the nicety of adjustment required, under the constantly varying pressure, was such that the passage of the steam was frequently shut off altogether, and at the hour of dinner the viands were of course found unaltered. About thirteen months since, I fitted up an apparatus in which I flatter myself, that I have completely obviated the objection above stated. My improvement in the steam kettle, consists in the application of a water joint, three inches deep, all round the inner and upper rim; this is filled by means of a lip or nozzle attached to any convenient part of the outside of the said rim, which is perforated to admit the free passage of the fluid; underneath this water-joint a small escapement or warning-pipe one-quarter of an inch in diameter is inserted, which, passing through the side of the kettle, is inserted about half an inch deep into a small condensing cistern containing cold water, which cistern is fitted with a waste-pipe at the side to prevent too much water being retained in it, and is soldered to the kettle by means of a strap of tin at each end, in such a manner that a plate of air, one quarter of an inch wide, or more, is left between the kettle and the cistern: the transmission of heat is thus prevented, and of course the addition of cold water rendered unnecessary except once or twice during the operation. When in use, the kettle is attached to the steam-cock by its ground nozzle, in the usual manner, the meats being placed in it, the lid is to be shut down, and secured from rising by hooks or hasps soldered for that purpose on the kettle; the rim-joint and cistern are filled with water, and the steam being turned on, the atmospheric air is first driven out through the warning or escapement-pipe; and when the kettle has attained its maximum of temperature bubbles of steam pass the same way and are condensed. The cock should then be regulated so that *these last may* *pass in the slowest manner possible*, and the cook may rest assured that whilst any bubbles are heard, however slowly they may come over, she has a surplus of steam, and consequently the operation is going on well: if, however, from the length of time occupied, the vessel should get sufficiently heated to throw off the slightest visible vapour, a dash of cold water in the condensing cistern or the rim-joint, as the case may require, sets all to rights in a moment.

On this plan I fitted up a single kettle for fish, a double ditto (one standing on the other) for meats and vegetables, a double evaporating pan for heating soups, and an oblong box containing three small saucepans for gravies, butter, &c.: as this last stands on the top of the boiler, and immediately under the chimney, I merely left a small hole, one-twentieth of an inch in diameter, for the surplus steam to escape. The lids of the saucepans fit into their respective water-joints on the box whenever the pans are occasionally removed, so as to prevent any waste of steam: the soup-kettle being double requires no escapement-pipe, but has a cock at the bottom to draw off the distilled water. These all stand in a small recess in the kitchen, about three feet deep, and are supplied by a cast-iron boiler thirteen inches square by eleven deep; and as the cheeks of the grate are flanged off in front at an angle of about forty-five degrees (as recommended by Mr. Stratton), a fire of thirteen inches from cheek to cheek will roast two joints of meat; this, with the oven and steam, will, in the most cleanly and economical manner, cook provisions for thirty persons, or more, if required, whilst the saving in labour and time to the servant cannot be fairly estimated except by a person who has watched both methods with attention.

Reference to the engraving.—Plate XII.

Fig. 1 is an elevation, and fig. 5 a bird's-eye view of the steam-vessel.

Figs. 3 and 4 are an elevation and section of the cover.

Fig. 2 is a section of the steam-vessel and its cover.

(The same letters refer to the same parts in all the figures.)

a Body of the steam-vessel.

b A pipe by which the steam is admitted.

c A channel or hollow ring surrounding the top of the steam-vessel.

d A lip for the supply of water to the channel *c*.

e A pipe bent at right angles, opening at one end into the steam-vessel *a*, and at the other end into the small cistern *f*.

f A small cistern open at top, having an exit pipe *g*, and attached to the steam-vessel by two thin plates *h h*.

i i Handles of the steam-vessel.

k The top and *l* the side of the cover.

No. XIV.

WARMING MANUFACTORIES.

The LARGE SILVER MEDAL was this session presented to T. BEWLEY, Esq., of Montrath, Ireland, for his mode of WARMING A COTTON-MILL BY MEANS OF THE HEAT PRODUCED IN BURNING LIME. The following communication has been received from him on the subject.

SIR, Montrath, Ireland, March 26, 1824.

As a candidate for the gold medal, offered by the Society of Arts, "for a method of heating rooms superior to, and cheaper than any hitherto known or in use, for the purpose of manufactures," I beg leave to enclose a drawing, accompanied by the required certificate, of a method which I have invented for heating my cotton mill, and which I have found, by several years' experience, fully to accomplish the important objects required by the Society, of *cheapness* and *superiority*, at least so far as I am acquainted with any other method.

I have to beg of you to lay the enclosed before the Society, and to express my hope that, upon due consideration of the plan, description, and observations annexed thereto, they may consider me entitled to the high honour of receiving their gold medal.

I am, Sir,
&c. &c. &c.
THOS. BEWLEY.

A. Aikin, Esq.
Secretary, &c. &c.

CERTIFICATE.

Mountrath, March 25, 1824.

We, the undersigned inhabitants of the town of Mountrath and its vicinity, do hereby certify that we have visited the cotton mill of Mr. Thomas Bewley; that the same is heated and ventilated solely by means of the burning of lime; and that it appears to us the heat so produced in the different rooms is fully adequate to this or any similar purpose.

Valentine Griffith, *Minister.*
J. Smith, *Resident Magistrate.*
W. Vicars Griffith.
Robert Knaggs.
E. H. Dempsy, Clk.
David Tingorah.
Thomas Borrowes.
Daniel Egan.
Anthony Deverill.
John Bray.
Michael Kelly.
Arthur Miller.

Description of the manner of heating and ventilating the cotton mill of Mr. Thomas Bewley of Montrath, by means of the burning of lime.—Plate XII., Fig. 6.

a a a a a Are the several rooms of the building.
b Is a kiln, in which lime-stones are burned.

c Is a canopy, or cover of cast-iron, placed over the kiln, from which proceeds *d d* a cast-iron pipe for carrying off the effluvia and smoke from the kiln.

e The chimney.

f The opening of the pipe *d*, round the outside of which the chimney is well closed in.

g The opening into the kiln for supplying the stones, &c., and which is closed with a strong sheet-iron door.

h h Is a brick wall surrounding the canopy *c*.

i Is a covering of bricks, bearing on iron bars on the wall *h*.

k Is one of several openings at the bottom of the wall *h*, for the admission of air.

l l l l Are apertures in the chimney *e*, for the admission of heated air into the several rooms: these openings have registers for regulating the quantity of hot air to be admitted.

m Is an opening into the chimney *e*, and is closed by an iron door: this door is only opened before setting fire to the kiln, for the purpose of cleaning the pipe *d*, which is done by letting down a rope, with a weight appended, to which is attached some straw or other matter.

n Is another opening into the chimney *e*, and closed by an iron door: this is also only used for cleaning the horizontal pipe *d*, which has here a cap or cover that may be occasionally taken off.

o Is the eye or aperture at the bottom of the kiln, for drawing the lime.

p An area surrounding the building.

q A floor or stage for breaking the stones and supplying the kiln; which is on a level with *r* the yard or ground outside the building.

s s The gable end and roof of the lime-house.

OBSERVATIONS.

THIS method of heating and ventilating is peculiarly applicable to manufactories, prisons, hot-houses, and all places where a steady, equable degree of heat is desired to be maintained. The lime is drawn from the kiln twice in twenty-four hours, (say at morning and evening), when fresh charges of stones and fuel are applied. If a still more steady degree of heat be required, the lime may be drawn three or four times in twenty-four hours, and layers of stones and fuel proportionally thin put on. It is obvious that heat is kept up during night as well as in the day time, which is a matter of great importance in almost every case where heat is necessary, thereby preventing those unpleasant consequences to machinery and materials which are often the result of a change of temperature; and also the loss of time which often occurs in the mornings where fires are to be lighted in the common way. This method is particularly pleasant to the working people, especially to children, as, in cold weather, they are always sure of finding the room comfortably warm on their arrival in the mornings, and are thereby induced to an *early* attendance at their respective employments.

Another very material advantage of this plan consists in its *great safety:* there being no possibility whatever (if the work be properly executed) of accident, or any unpleasant effluvia from the fire,—as it is apparent, from a view of the drawing, that the pipe *d d* carries off all sparks, smoke, smell, &c., nothing being admitted into the rooms but the air which enters at the apertures, one of which is shown at *k*, hence passing over and about the canopy *c*, and along the outside of the pipe *d d*, it is heated to a high degree, and blows out with great violence into the different rooms at the openings *l l l l*.

Another very important matter connected with this plan of heating is, that the fuel, which is the most proper for use, is of that description which is applicable to no other purpose, and consequently cheaper, namely, culm, cinders, &c. &c.

But the most important quality belonging to this mode of heating rooms, consists in its *cheapness*, or rather in its affording a *profit*, independent of the heat. Lime is an article every where used, and always in demand: it is, therefore, to be presumed, there are very few situations in which lime may not only pay the cost of burning, but leave a profit on the manufacture.

For the general purposes of warming and ventilating manufactories, &c., no more heat is necessary in this way than the superfluous heat which is unavoidably produced by the calcining of the lime-stones. The cotton mill, to which the annexed drawing refers, consists of five rooms; the under one alone it is not necessary to heat; the rooms are about fifty feet long by twenty broad. The heated air, immediately on its admission into the rooms, at the openings *l l l l*, frequently raises the thermometer to one hundred and forty degrees; but the general temperature of the apartments may be about eighty degrees. The kiln is a small one, being only eleven feet deep and seven feet at its greatest breadth, the situation not admitting of a larger; but it would be advisable, in point of economy, to have the kiln deeper. Before the adoption of this plan of heating, a considerable sum was necessarily expended annually in fuel; but since this method has been applied, so far from the heating of the mill being attended with expense, the sale of the lime has afforded a profit, not to mention the great superiority of this method of heating to that of burning fuel in the common way.

In situations where lime-stones cannot be had, heat may be advantageously supplied in this way, for the purpose of manufactories, by the burning of bricks, tiles, &c.: in this case there ought to be two kilns, communicating each occasionally with the same chimney, so as that one may be in use while the other is in preparation.

Clay may also be in many places burned for the purpose of manure with the greatest advantage.

The application of this plan, of heating and ventilating, to prisons, penitentiaries, &c. might be attended with many beneficial consequences; as, beside contributing to the health and comfort of the inmates, it might be the means of useful aud profitable employment, as all the operations necessary are within the compass of moderate abilities.

THOS. BEWLEY.

No. XV.

APPARATUS FOR THE USE OF INVALIDS.

The SILVER VULCAN MEDAL was this session presented to Mr. J. BOTHWAY of Devonport, gunner in the royal navy, for two species of apparatus: by means of the first of which an invalid or bed-ridden person may raise himself in bed from a recumbent to a sitting posture; and by means of the second, one or two assistants may raise from bed a person completely unable to help himself. Models of the apparatus have been placed in the Society's repository.

THE first of Mr. Bothway's inventions consists of a web of carpeting, which is placed round the shoulders of the invalid, having a cord attached to it, which cord passes over a pulley fixed to the bed-post. The end of the cord is brought round to the hand of the invalid, who, by pulling at the cord, may raise himself in bed to a sitting posture without help, and by letting go the cord, may again bring his body to a recumbent position.

The second invention is to enable one or two attendants to raise a sick person entirely out of bed, in order to have the bed made, or for other necessary purposes. This is effected by placing two webs of carpeting under the patient, to which are attached cords that pass over a pulley fixed in a movable jib, or in the cieling, by means of which one, or, at the utmost, two attendants can raise from bed any person however bulky and helpless he may be.

References to the apparatus of Mr. Bothway for the use of invalids.—Plate XIII.

Fig. 1.

a A piece of ticking or carpeting, wadded on the side that touches the patient, with tucks at the opposite vertical sides to receive two flat wooden stretchers.

b b Two chains or braces, having an eye in the middle of each.

c A flat board, strengthened by a rim of brass, on each side of the base of which projects a horn *d d*, with notches to receive the eyes of the braces *b b*.

e A hook which takes into an eye at the top of the flat board *c*, and is connected at the other extremity with a pair of two-sheaved blocks *f f*, into which a cord *g*, is rove.

h A hook at the extremity of the upper block, which takes into a staple fixed in the middle of a strong leather strap *i*.

Fig. 2 shows the apparatus in use, the same letters referring to the same parts as in fig. 1.

Fig. 3. An apparatus for the purpose of raising an infirm person out of bed.

a a Two pieces of carpetting or wadded ticking, to be introduced separately under the body of the patient.

k k Two wooden stretchers which are to be introduced through the tucks of *a a*, in order to connect the two pieces of ticking.

l l l l Two opposite eyes in each piece of ticking, in which the hooks of the chains *b b*, are fastened; the eye *m m*, of each chain is then placed on the horns or curved extremities of the bar *n*, and the bar itself is attached by means of its loop to a pair of pullies *o o*, by pulling at the cord of which, the apparatus with the patient reclined on it, is raised out of bed.

No. XVI.

REMONTOIRE ESCAPEMENT.

The sum of TWENTY GUINEAS *was given this session to Mr. J.* AITKIN, *St. John-street, Clerkenwell, for a* REMONTOIRE ESCAPEMENT. *The following communication has been received from him on the subject; and a model of his invention has been placed in the Society's repository.*

55, St. John-street, West Smithfield,
March 1, 1824.

SIR,

I BEG leave to request that you will have the goodness to submit to the Society for the encouragement of Arts, Manufactures, and Commerce, the accompanying model of a time-keeper, containing my invention of a new remontoire escapement, by which the motive force is transmitted to the escapement uniformly and without impeding the vibration of the pendulum, which is the case in all those that I have hitherto seen.

I am, Sir,
&c. &c. &c.
JOHN AITKIN.

Arthur Aikin, Esq.
Secretary, &c. &c.

Reference to the engraving of Mr. John Aitkin's Remontoire Escapement.—Plate XIV.

FIG. 1 is a view of the escapement, having the front plate removed.

Fig. 2 is a side view.

Fig. 3 is a longitudinal view of the axis of the escapement-wheel and a section of its appendages.

(The same letters refer to the same part in each figure.)

A A Is the front plate, and B B the back plate, the lower part of which is represented as broken off: the dotted circle D represents the fuzee-wheel, which works into the pinion *e*.

E Is the second wheel, which is fixed on the axis of the pinion *e*, and works into the pinion *f*.

F The third wheel, which is fixed on the axis of the pinion *f*, and works into the pinions *g* and *h*.

G The escape wheel, H the palettes.

The pinion *h* is fixed on the axis *i i*, and also eight spring detents *j k l m n o p q*, the ends of which rest against the cylindrical side of the axis *r r* of the escape-wheel, and escape through the notches 1 2 3 4 5 6 7 and 8 in succession, as the axis *r r* turns round.

The position of the gaps, in the side of the axis *r r*, is represented in fig. 4 by the figures 1 2 3 4 5 6 7 and 8.

The axis or arbor *r r*, on which the escape-wheel is fixed, passes through a cylindrical hole in the pinion *g*, and is at liberty to turn freely within it.

s Is a collet, which is fixed on the socket of the pinion *g*.

Fig. 5 is an end view of the collet *s*, together with the helical spring *t*, one end of that spring being fixed to the collet *s*, and the other end to the collet *u*.

Fig 6 is an end view of the collet *u*: this collet is fixed upon the arbor *r r* by the set screw *v*, and by means of it the spring *t* may be wound up to a proper strength, so as to overcome the friction of the axis *r r*, and cause the escape-wheel G to turn round. When the clock has been wound up, the pendulum put in motion, and the axis *r r* of the escape-wheel has turned one-eighth round, the detent *j* will be at liberty to pass through the gap *g*; then the wheel F will cause the pinion *h*, together with the *detents*, to turn one-eighth round, consequently the detent *k* will be turned till it rests against the cylindrical side of the axis *r r*, opposite to the gap 7; the wheel F will also at the same time turn the pinion *g*, together with the collet *s*, one-eighth round, which will rewind the helical spring *t*, and give sufficient power to the escape-wheel *g* to make one-eighth of a revolution more by the unwinding of the spring; the detent *k* will then be at liberty to escape, and the wheel F will again cause the pinions *h* and *g* to turn one-eighth round, and at the same time the helical spring will be again wound up.

IN this instrument the swing-wheel acts with an equal force, when the motive power is even doubled, without affecting the isochronism of the pendulum. This is not the case in the clocks hitherto constructed by Mudge, by Cumming, and others of a later date; for all those, more or less, are affected by the irregularity of the train, and therefore the pendulum is more or less disturbed by the unlocking of the detents.

Those who possess clocks on the remontoire principle, as hitherto constructed, will find, on trial, that by adding a double weight, the irregularity will increase, or rather the clock will stop altogether. But an increase of weight will not stop my time-keeper, nor cause any irregularity in its motion. They will also have the mortification to find, on trial, that the usual dead beat escapement is absolutely preferable to to those elaborate escapements.

An objection may arise respecting my contrivance, namely, that the renovating spring, in its unbending is weaker than when bent up; but these inequalities are constantly the same every 6″, and therefore do not destroy the isochronism of the pendulum. It would, perhaps, be better to have ten notches in the cylinder, in which case the spring would be unbent once in 6″. The notched cylinder may be about the tenth of an inch in diameter.

JOHN AITKIN.

No. XVII.

SELF-ACTING FEEDER FOR HIGH-PRESSURE STEAM-BOILERS.

The LARGE SILVER MEDAL *and* FIFTEEN GUINEAS *were this session presented to Mr. R. W.* FRANKLIN *of Tottenham Court-road, for his* SELF-ACTING APPARATUS FOR FEEDING HIGH-PRESSURE STEAM-BOILERS. *The following communication has been received from Mr. Franklin on the subject.*

92, Tottenham-court-road,
March 8, 1824.

SIR,

I REQUEST that you will submit to the inspection of the Society of Arts a method invented by me for feeding the boilers of high-pressure steam-engines by means of a float. It is the universal practice to feed the boilers of condensing engines by this method; but to its application in the usual way to high-pressure boilers there are two objections. The first is the inconvenient height of the jack-head, in order to counterbalance the pressure of the steam, (a pressure of forty pounds on the inch requiring the jack-head to be seventy feet higher than the boiler): the second, is the difficulty of packing the float-rod, so as to prevent the escape of steam and yet allow the rod to move easily when acted on by so small a force as the hydrostatic weight of the float.

My improvement consists in the substitution of a heavily-loaded valve instead of a high jack-head, and in avoiding altogether the use of a stuffing box, by placing the lever of the float within the boiler, as will be evident on referring to the representation in plate XV.

a a Is the top of the boiler, *b* the man-hole, *c* the level of the water in the boiler, *d* a lever suspended by an arm to the top of the boiler, and having the float *e* at one end and the counterpoise *f* at the other. *g* Is a rod of half-inch round iron, connected with that arm of the lever which carries the counterpoise: it passes through the guide or ring *i*, which is rivetted to the feed-pipe *k*, and expands at bottom into a round flat disk *h*.

The feed-pipe *k* is long enough to have its lower orifice always below the level of the water *c*; its upper end is closed by the valve *l*, and to the bottom of the valve is screwed a long tail or spindle, which, when the valve is shut, descends below the opening of the feed-pipe, and almost rests upon the plate or disk *h*. As the water lowers by evaporation, the float end of the lever descends and the opposite end rises; the consequence of this will be to raise the rod *g*, to bring the plate *h* in contact with the end of the spindle of the valve *l*, and thus to raise the valve itself above the opening of the feed-pipe, as represented in the plate. The box *m* having been previously filled with water by means of the forcing-pump at the end of the service-pipe *n n* (not represented in the plate), all reflux of hot water from the boiler is prevented by the valve *o*. As soon as the pressure of the forcing-pump exceeds that of the steam, the valve *o* is lifted and water passes through the pipe *n* into the box *m*, and thence down the feed-pipe *k* into the boiler, the valve *l* being prevented from closing by the support which it receives from the plate *h*. As the level of the water in the boiler rises, the counterpoise end of the lever *d* descends, and with it the rod *g*, the plate *h*, and the valve *l*. In this position of the machinery the water delivered by the service-pipe raises the valve *p*, passes into the box *q*, and flows off by the waste water-pipe *s*. The valve *p* also acts as a safety-valve to the boiler, its pressure being adjusted by means of the weight on the lever *r*.

The working pressure of the steam in the boiler having been determined, the load on the valve *p* must be greater than this, but less than the power applied to the forcing-pump.

I am, Sir,
&c. &c. &c.
R. W. FRANKLIN.

A. Aikin, Esq.
Secretary, &c. &c.

No. XVIII.

TRUSS FOR RAISING A SUNKEN FLOOR.

The LARGE SILVER MEDAL *was presented this session to Mr. F.* RICHMAN, *Great Pulteney-street, for his method of* RAISING A SUNKEN FLOOR. *The following communication has been received from him on the subject; and a model of his invention has been placed in the Society's repository.*

IN consequence of the removal of a framed trussed partition, in order to throw two rooms into one, it was found that, part of the support being thus taken away, the beams had swagged in the middle of the floor about five inches, and the floor had become very tremulous, so as to be utterly unfit to bear a billiard-table, which was the original motive for removing the partition.

The cieling and cornice of the room below being valuable it became an object of consideration to apply some mode of relieving the timbers from above, which was successfully effected by Mr. Richman in the following way.

Having removed the floor, he applied to each side of the swagged beam an arch of cast-iron, the span of which was equal to the length and the height or spring to the depth of the beam. A chord of bar-iron unites the two ends of the arch, and prevents them from spreading. Four equidistant transverse holes were cut in the beam, nearer the bottom than the top, through each of which was passed a bar, having its ends resting on the two opposite arches. An upright bar, or truss-iron, screwed at top, is secured to each end of the transverse bars; these uprights are somewhat higher than the beam, and each opposite pair is coupled by a flat bar with two eyes or holes, which admit the screwed ends of the uprights; a nut is then put upon each screw, and it is obvious that, by screwing down the nut, the curved part of the beam will be raised till it becomes level.

Fig. 1 is the plan or bird's-eye view of a trussed girder, showing the flat bars lying across the top of the beam, and coupling together each pair of screwed upright pieces.

Fig. 2 is an elevation, showing the arch with its chord and upright, and the beam behind them.

Circumstances did not admit of the arch or chord being made in one piece; and the manner in which the several parts were connected together being not capable of description by mere words, the following figures will, it is hoped, elucidate this part of the subject.

Fig. 3 represents the right hand end of fig. 2 on a larger scale. *a* Is the abutment-plate, of which fig. 10 is a plan, and fig. 11 a sectional elevation. In the upper holes in fig. 10 are inserted two bolts, which, passing through the beam, enter into the corresponding holes of the opposite abutment-plate, and are secured by nuts, as shown in fig. 3. *b*, fig. 3, Is one of the cast-iron pieces that compose the arch; the end by which it rests against the abutment-plate is rounded, as shown fig. 8, (fig. 9 being a sectional elevation of the same). The other end of this piece, and both ends of all the other pieces, (except the terminal one, which is similar to *b*), is as shown in fig. 5, which is a side view, and in fig. 6, which is a bird's-eye view.

c, fig. 3, Is one of the end pieces of the chord; the broad part of it is shown fig. 15, and the sectional elevation fig. 16 shows the extremity of it bent up at right angles to the other part. Being laid on the abutment-plate, as shown fig. 3, it is secured by two screwed bolts, which, like the upper bolts of the same plate, pass through the beam to the abutment-plate on the other side. The other end of the chord piece is formed into a kind of shallow hook, and joins the next piece in succession, as shown fig. 14, the joint being secured by a metal cap or ferrule *e*, fig. 3, drawn over it. Figs. 12 and 13 show the figure of all the chord pieces except the two end ones.

Fig. 4 is a section of the beam and truss, to show the insertion of the transverse bars *f*; these bars are notched at the ends (figs. 17 and 18) for the reception of the two uprights *d d*, fig. 4: a square end, like a nail head, prevents these uprights from being drawn through the notches in *f*. The junction of two of the arch pieces forms a cylindrical cavity, (seen in transverse section, fig. 7), through which the upright *d*, fig. 3, passes; a box or square collar is put over the screwed end of the upright, and then the nut, the action of which is to raise the upright, and with it the transverse bar, and thus to straighten the swagged beam, the arch *b* forming the point of support, and being itself prevented from yielding by the tie or chord of bar-iron *c*.

SIR, 35, Great Pulteney-street, May 11, 1824.

ACCORDING to promise I send you a description of my trussed girder, as follows:

The merits of the invention, according to my opinion, are—

First, that the expense of wood patterns is so trifling as to be of very little consequence.

Secondly, that all the iron work is in very small handy pieces, and therefore easily carried to the place where required, up stairs or ladders; and also very easily applied to its proper place.

Thirdly, that the abutment is produced by an iron tie or chord line bar, which renders it impossible to fail, if the iron is good, and so sound as to prevent any trembling of the floor. And,

Fourthly, which is the principal thing aimed at, it is a certain method of restoring a floor to its original straight line, however much it might have swagged, without the least damage whatever to the cieling, which has been proved in its application to the floor mentioned in my former letter.

I am, Sir,
&c. &c. &c.
F. Richman.

A. Aikin, Esq.
Secretary, &c. &c.

No. XIX.

CAST-IRON TRUSSES OR CRADLES FOR SUSTAINING DECAYED OR SUNKEN TIMBERS.

The LARGE GOLD MEDAL *was this session presented to Mr.* ALFRED AINGER, *for various* CAST-IRON TRUSSES *or* CRADLES, *adapted to the support and preservation of partially decayed and sunken beams, girders, or other large timbers. The following communication has been received from him, and models of the inventions have been placed in the Society's repository.*

22, Everett-street, Russell-square,
January 20, 1824.

DEAR SIR,

I HEREWITH offer to the Society models and drawings of various cast-iron trusses or cradles designed for the purpose of supporting girders, tie-beams, or other timbers whose ends have become decayed; and also for raising and sustaining bearers of any sort which have sunk in the middle. Before describing any of these particularly I will detail the circumstances which led to their invention, and to the successful application of one of them in a case of considerable difficulty.

During the repairs performed in the past year to the church of St. Mary Aldermary in the city of London, one of those erected by Sir Christopher Wren, it was discovered that nearly all the timbers of the roofs or flats over the aisles had become infected with the dry-rot, some of them so much decayed by it as to have lost all bearing on the walls, and to have suffered a partial decomposition through their whole length. Their removal would have involved the destruction of a highly enriched, groined, and pannelled cieling, whose restoration would have cost probably five thousand pounds, and the ribs and cradling of which (themselves in some parts almost perished,) were immediately suspended from the decayed and decaying beams.

To secure these beams therefore, not merely without removal, but with as little cutting and violence as possible, became an object of considerable importance. To have bolted pieces of timber to their sides, as is commonly practised, would have been altogether useless, for, by that plan, the weight is made to rest on a bearing equal only to the size of the bolts, which would have cut through or crushed the fibreless and disintegrated matter to which the ends of the beams had become reduced. Independently of which, it is evident that the support afforded by one piece of timber bolted to the side of another depends on the resistance offered by each of them to opening or splitting in a line with one or more of the bolts which pierce them, and that they have to oppose the mere cohesion of their fibres to the operation of a powerful leverage; that cohesion is in the first instance uncertain and inadequate, and it becomes every day more so by the progress of the disease in the old timber, and by its inevitable communication to the new.

The use of wood, therefore, was rejected, and the application of iron determined on. The number of beams in the condition described was fifteen, making of course thirty ends which required securing. Economy dictated the use of cast-iron in a case where so many similar parts would be wanted, and it only remained to dispose the metal in such form as should make the smallest possible quantity prouce the required effect, and should at the same time afford he greatest facilities in fixing. The form described in the nodels and drawings seems obviously to answer these conlitions: it was adopted, and the plan carried successfully nto execution with a degree of rapidity and ease which was in some measure surprising even to myself, and without the slightest injury to the cieling*.

That part of the roof which covered the nave, and which was composed of principal rafters and tie-beams framed with king-posts in the usual manner, was comparatively sound, but, nevertheless, decayed to a greater or less extent at all the bearings on the walls. In the former case it was required merely to support the ends of a simple bearer or girder, pressing perpendicularly by its own weight and that of its load; a task much easier than that of receiving the weight of the horizontal beam with its load, and at the same time opposing the lateral thrust of the rafter loaded with two or three tons of timber and lead, increased to four or six tons by reason of its inclined direction. I send a model of a design which I made for this purpose, but which, from various causes, was never executed. Among these causes, however, must not be placed any doubt of its success or of its economy, because, from the experiments made with the model, it appears to be perfectly easy in its application and effectual in accomplishing its object†.

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* The details of the mode of fixing, expenses, and other particulars, are given in the description of the engravings.

† This also will be found more particularly described in the references to the engravings.

Together with these I send a model of a plan for quickly and cheaply raising and sustaining swagged or sunken girders, with the least possible disturbance of the floor, and without any injury to the cieling below it *.

I am, dear Sir,
&c. &c. &c.

A. Aikin, Esq.
Secretary, &c. &c.

ALFRED AINGER.

Reference to the engravings.—Plate XVII.

FIG. 1 is a side, fig. 2 an end, and fig. 3 a top or bird's-eye view of the truss first alluded to, exactly as it was applied. In each figure *a* is the wall plate, the beam being shown wholly unsupported by it, as was the case with several of those to which the trusses were fixed. The trusses or cradles consist of two equal and similar cast-iron side pieces, each composed of two triangles, *b c d e*, spreading at the feet *b*, to rest on the wall plate, and each having three ears *c c′*, *d d′*, and *e e′*, pierced to receive the wrought-iron bolts which unite each pair together. The bolts, of which one is shown separately at *f* fig. 4, were made with a head at one end and a slit at the other, to receive a key, (see *g*, fig. 4). Between the bolts and the timber were introduced cast-iron plates, their length equal to the width of the timber, and their breadth six inches: one of these is described at *h* and *i* fig. 4, showing the groove which received the edge of the bolt *f*. The operation of fixing was as follows:—A temporary support was given to the eam ; so much of the rotten timber as seemed advisable as cut away; the wall plate, which had decayed, was exhanged for a new one; and one man being placed on each ide of the beam, the two halves of the truss were at the ame moment rested on the wall plate and supported at he other extremities by one hand of each man, while, with the hand at liberty, one man passed the bolt through the the ear d', and it was guided through that at d by the remaining unemployed hand, which also introduced the key. The weight of the trusses being thus supported, they were left suspended by the bolt at d d', while one man took one of the grooved plates h, fig. 4, and held it against the underside of the beam at e, till the bolt could be passed through by the other. This bolt being also keyed, the ends d d', were lifted till the plate at e pressed against the beam, (from which it would be distant in the first instance about half an inch,) a grooved plate was then put under the bolt at d, the keys were slightly tightened to give connection to the whole, and two pairs of oak wedges k k and l l, were driven under the plate at d, by which of course the bolt and plate at e were made to *bite* against the beam, and the feet of the trusses were thrown with great force upon the wall plate. By using two pairs of wedges each foot was made to take a bearing independently of any irregularities in the wall plate or in the shape of the beam. A similar bolt, plate, and wedges, were applied at c, but these were merely to give stability and connection to the several parts, as they evidently support no part of the weight. The feet of the trusses had notches on their edges, in which spikes were driven to restore the usual connection between the timber and the wall. The whole operation of fixing (excluding of course the time employed in supporting the beam, exchanging the wall plate, and so on,) occupied, as may be imagined, not more than ten or fifteen minutes, nor did it occasion the slightest disturbance either to the ribs or plastering of the appended groining and pannels.

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* A description of this is added to that of the other engravings.

The principle upon which this truss is constructed is evidently that of converting a transverse strain upon a certain quantity of metal into two other strains, each acting upon half the quantity, nearly in the direction of the length, one having a tendency to crush or bend, and the other to rend the metal: the two upper limbs, *b c* and *c d*, are in this case exposed to the former, and the two lower ones, *b e* and *e d*, to the latter. To make the truss, therefore, theoretically perfect, it would require that the strength of the upper and lower limbs should have an accurate relation to the different offices they perform. The liability to compression is small compared with that to extension, but the latter may, in some cases, be less than the liability to bend; this last, in fact, is so uncertain as to defy any very nice applications of theoretical strength, while the tension, and consequently the required size, of the lower limbs may be ascertained with great precision. The tension on the limb *b e*, for instance, and on the similar limb on the other side of the timber, may, with sufficient accuracy for all practical purposes, be resolved into a case of the bent lever, in which *b e* may be considered one arm, *e c* the other, and *b* the point at which the power is applied, (the power being half the weight of the beam and its load, when the load is equally distributed). If, therefore, 10 represent the arm *c e*, and 25 the arm *b e*, which were about the actual lengths in inches, measuring from the intersections of the centres of the limbs; if, also, W express he whole weight of the beam and its load, then putting $\frac{W}{2}$ for the power, the direct strain on the two limbs is $\frac{25}{10} \times \frac{W}{2} = 1.25\ W$, or one and a quarter times the whole load. The tension then, on each, is ,625 W; and if F measure the cohesive force of a square inch of the material in the same terms (pounds for instance) as those in which W indicates the weight of the load, the required area of section for each of the lower limbs will be expressed in inches by $\frac{,625\ W}{F}$.

The calculated size for the lower limbs will generally be found sufficient for the upper ones, and as the metal cools better in uniform bars than in others, it will seldom be advisable to make any difference.

In this particular case the section of each limb was a parallelogram, two inches by one inch, having the two external angles truncated or reduced till it approached to a triangle, and till the area was 1.6 inches. In an experiment made for the purpose of assuring the safety of the trusses, they were applied to a new piece of timber twelve inches by ten inches, their feet resting on bearers twenty-one feet asunder. The beam was about twenty feet long, consequently clear of the bearers at each end, and it was loaded gradually with somewhat more than six tons. It was by that time considerably bent, and as the load was much larger than that which the actual beams could ever have to sustain, it was useless to pursue the experiment farther. The ends remained perfectly unaltered, and thus assured the efficacy of the trusses to the amount of six tons.

It has been shown before that the tension on the limb *b e*, and on the corresponding limb on the other side, is equal to one and a quarter times the whole load, equal therefore, in this experiment, to seven and a half tons. But as two cast-iron bars, having each a sectional area of 1.6 inches, will sustain upwards of twenty-two tons, the load might have been increased to somewhat more than $\frac{22}{1.25}$ or eighteen tons. This would, however, be approaching too nearly the breaking point for practice. *One half* the weight that would produce fracture is generally considered the largest load to which any material *should* be permanently exposed. One half, therefore, of eighteen tons is the greatest weight that these trusses should constantly bear. It is almost needless to add that *their* strength may be increased, as circumstances require, without limit.

The size of the ears will of course require no less consideration than that of the limbs. Those at *e* sustain the greatest weight, which may be thus ascertained:—suppose the two limbs *b e* and *c d* to form one lever, *d* being the fulcrum, *b* the place of the power, and *e* that of the weight. The power, as already shown, is half the whole load, or $\frac{W}{2}$; the limb *b e* was twenty-five inches, and *c d* twenty inches, the whole length of the lever therefore forty-five inches, and the pressure on the ears at *e* equal to $\frac{45}{20} \times \frac{W}{2}$, or 1.125 W, being somewhat less than that which the limbs *b e* receive. But as the ears are more exposed to sudden shocks, especially in fixing, they should be made at least equal to the limb; and in this case they were so, being made as much wider than the limb as the width of the bolt-hole, that is to say they were two and a half inches wide, and pierced with a hole half an inch wide. The quantity of metal below the bolt was one and a half times that on each side.

The bolts were two inches by half an inch; and the bottom of the groove in the plates being made rather hollow from end to end, caused the bolts to rest only at the extreme edges of the plates, and gave to them all the strength of which they were susceptible.

As in most of the cases to which these trusses would be applicable it is requisite that they should not occupy a space much greater than the depth of the timber itself; in all these the cast-iron grooved plate and the bolt may be advantageously exchanged for a wrought-iron plate terminating in a screw bolt at each end, and the plate may be cut into the surface of the timber as much as circumstances render necessary. This will be understood by the description of the other trusses in which such plates are introduced.

It has been objected, and perhaps may again be so, that the oak wedges are liable to become infected by the rot and to decay. It would be a very short answer, and one involving no difficulty nor much expense, to say—use iron: but the fact is that iron would give no advantage to counterbalance the convenient facility with which wooden wedges are made to accommodate themselves to irregularities in the size or surface of the timber. It will be observed that there are no wedges at *e*, those at *c* are not at all concerned in supporting the weight, and those at *d* are so far removed from the seat of the disorder that before it could materially affect them the beam must drop from its rottenness at *e*.

Farther than this: as the wedges should be of new good oak it is hardly possible that they should become worse or even so bad as that part of the beam immediately under them; still less likely are they to become so bad as the timber of the beam at *e*, which receives a pressure more than double that to which the wedges are exposed.

All this, however, would be no argument for the use of pieces of oak bolted to the sides of the beams, because the ends of those pieces next to the wall would inevitably receive the infection; and as the support they give depends on the adhesion of their fibres even to the extremity, they immediately begin to lose strength. Besides which, the destruction of the lateral cohesion and tenacity of the fibre is the first effect of the dry-rot, and takes place long before the wood has lost the power of supporting a considerable weight pressing on its surface.

In regard to expense the advantage is greatly in favour of the iron; the whole weight of cast-iron at each end was one hundred and twenty-six pounds, and of wrought-iron twelve pounds. The cast-iron was supplied at fourteen shillings per cwt., and the wrought-iron at sixpence per pound. The expense of fixing, as has already been stated, is scarcely appreciable. If this be compared with the value of two pieces of oak, each six feet long, twelve inches deep, and four inches thick, together with three or four screw-bolts weighing nine or ten pounds each; and if to this be added the difficulty and risk of boring bolt-holes in timber so situated, the difference will be found to be in the ratio of not less than two to one.

Figs. 5 and 6, of the same plate, are a side and end view of the truss or cradle designed for the principal rafters and tie-beams. In this truss there is a peculiarity arising from the circumstance that the width or thickness of the rafter is generally less than that of the tie-beam, as shown in fig. 6, and this requires that the limbs of the truss should not form straight lines, but that, in passing from the tie-beams on to the rafter, each should deviate half the difference of thickness of these two: that deviation is made where the bolts *n* and *o* pass through, in order that no loss of strength may be occasioned. The tie-beam rests upon a large wrought-iron plate, terminated at each end in a screw-bolt, as was suggested in reference to the former case, thus saving the depth occupied by detaching the bolt from the plate. The edges, *r r*, of the trusses are made thicker on the inner faces, and are cut into the sides of the rafter, as shown at fig. 7. At *q* there is a cast-iron plate, and a bolt with wedges similar to those before described, the tightening of which brings the plate *p* against the underside of the tie-beam. The action of the truss is as follows:—the perpendicular weight is sustained on the same principle as in the first case, by the two opposing pressures at *p* and *q*, through the intervention of the strut *m*, which is introduced for the purpose; the lateral thrust is resisted by the edges *r r*, cut into the sides of the rafters; and less directly, but more powerfully, by the bolt, plate, and wedges at *q*, as may be understood by considering that any tendency to lateral motion in that part of the rafter at *q* must describe a circle, having the strut *m* for radius and its lower end for a centre; the inclination of *m* from the perpendicular gives, therefore, to the rafter a tendency to move somewhat upwards in opposition to the bolt, plate, and wedges at *q*, and of consequence to the whole weight of the roof acting on the plate *p*; the two pressures, therefore, one arising from the actual weight of the rafter and its load, the other from its lateral thrust, are made to oppose and to annihilate each other as far as any tendency to derange the parts of the framing is concerned, and the whole is reduced to a simple perpendicular action on the wall through the feet of the truss. A cast-iron plate and wedges are put under the bolt at *o*, which has the effect of tightening the whole and of supporting the tie-beam, if it should ever be required temporarily to remove the rafters. The bolt *n* is merely for connection with the rafter, and for maintaining the strength of the truss where it deviates from the straight line: *y y*, in fig. 5, is the line of section in fig. 6, and *z z* in that of fig. 7.

The same principles of calculation as those applied in the last case will determine the requisite strength of the several parts, and the saving of expense, as compared with any possible way of accomplishing the same object by oak blocks bolted to the timbers will be found to be in a still greater ratio; probably as three or four to one.

Figs. 8 and 9, of the same plate, describe a mode of raising and sustaining a sunken or broken girder, requiring the exposure of not more than four or five feet of the upper surface, and not at all disturbing the cieling. The cast-iron truss consists of two similar pieces, each composed of two triangles and a square or parallelogram, the lower part of which supports a wrought-iron plate, with two screws at each end, (shown separately at *s s*). Two smaller plates with screws bear on the top of the girder at *t* and *u*. The underside of the girder is notched to admit the plate *s s*, and it may be partially cut through at the top, then driving wedges between the plate *s s* and the timber, the centre of the girder will be raised to any required height, and will remain so.

A. Ainger.

No. XX.

MAGNETIC GUARD FOR NEEDLE-POINTERS.

The Thanks of the Society were this session voted to Mr. A. WESTCOTT, for his MAGNETIC GUARD for persons employed in POINTING NEEDLES.

ON the 27th March, 1817, Mr. Westcott appeared before the Committee of Mechanics, to exhibit and explain an invention of his for the relief of persons employed in needle-pointing. It consisted in a number of bar magnets, smeared with oil, placed in a frame behind the grindstone, for the purpose of detaining, by magnetic attraction, the particles of steel abraded in the process of grinding, and the earthy particles, by the glutinous property of the oil.

Mr. W. stated that he had constructed an apparatus on the above plan, and had sent it to Mr. Hemming, needle-manufacturer at Red-ditch in Warwickshire, for trial. The farther consideration of the subject was postponed, the committee being desirous of awaiting the result of the experiment at Red-ditch.

On the 7th May, 1822, Mr. Abraham's magnetic guard for dry-grinders was taken into consideration. In the course of the examination the proceedings above recited concerning Mr. Westcott were read, and no farther intelligence having been received from that gentleman, the secretary was directed to write to him on the subject. On inquiry, however, it appeared that Mr. Westcott had quitted his former residence (the house having been burnt down), and the committee being able to obtain no trace of him, the proceedings respecting Mr. Abraham's invention were brought to a conclusion, and a reward was voted to him.—See vol. xl.

This circumstance coming to the knowledge of Mr. Westcott, he addressed a letter to the secretary requesting the Society to proceed with their investigation of his invention. This being acceded to, Mr. W. appeared before the committee, but was unable to give any farther account of the matter than that he had sent his machine, seven years ago, to Mr. Hemming, who had promised to make use of it, but whether such trial was ever made he does not know, having never made any farther inquiry.

No. XXI.

WORKING DRAWINGS OF A STEAM-ENGINE.

The sum of TWENTY GUINEAS *was this session given to Mr.* STIRLING *of Glasgow, for a set of* WORKING DRAWINGS OF A CONDENSING STEAM-ENGINE.

THE drawings are five in number, containing plans, elevations, and sections, drawn to a scale, accompanied by a full description. The engine is on the construction of Boulton and Watt, with few variations.

The drawings and description remain in possession of the Society, and may be seen on application to the secretary or the housekeeper.

PAPERS

IN

COLONIES AND TRADE.

No. I.

SILK FROM THE ISLE OF FRANCE.

The LARGE GOLD MEDAL *of the Society was this session presented to* M. CHAZAL *of the Isle of France, for upwards of* ONE HUNDRED POUNDS OF SILK, *raised by him in that colony. The following documents have been received on the subject; and specimens of the silk have been placed in the Society's repository.*

No. 1, Lime-street-square, London,
March 1, 1819.

SIR,

As the agents of M. de Chazal, a planter of the Isle of France, we herewith transmit a specimen of silk produced on his estate in the year 1817, together with a memoir on the silk-worm, and the culture of the mulberry-tree, drawn up by M. de Chazal, and certified by the governor of that island, which we request you will have the goodness to lay before the Society for the encouragement of Arts, Manufactures, and Commerce, for their inspection, M. de Chazal being a candidate for the premium offered "for the greatest quantity of silk, not less than one hundred pounds weight, produced by any person in the Isle of France in the year 1817, from silk-worms bred there."

We are, Sir,
&c. &c. &c.
MATHESON, JOHNSTON, & CO.

Arthur Aikin, Esq.
Secretary, &c. &c.

A SHORT time before the conquest of the Isles of France and Bourbon by the British, the French ministry had formed the project of introducing the culture of silk into these islands. A sum of money had been assigned to this purpose, and the persons to whom the execution of the plan had been entrusted, had already arrived. From causes which have not been explained the attempt failed.

Sir R. T. Farquhar having been appointed governor, renewed the attempt. He procured silk-worms' eggs from Bengal, and on the 20th of December, 1815, entrusted them to the care of M. Chazal. By the 20th of March, in the following year, about eighty thousand coccoons had been obtained, twenty-five thousand of the best of which were selected to afford eggs for the next season. The remainder of the coccoons being wound off, afforded about one hundred and eighty ounces, French, of silk.

The increase of the silk-worm is much more rapid than that of the mulberry, on the leaves of which it feeds. M. Chazal, accordingly, applied himself strenuously to the establishment of plantations, partly of the white mulberry, and partly of the mulberry of Bengal. The plants were put into the ground at the distance af about three feet from each other, and were not allowed to grow to a greater height than four or five feet, for the convenience of gathering the leaves. As the plants get old, they will require to be cut down to the ground, in order to obtain vigorous new shoots, and, in a well-regulated plantation, a certain proportion will be thus treated every four years. By the end of the year 1817, M. Chazal had completed plantations of the extent of forty arpents, containing about two hundred thousand mulberry plants.

The warm and generally temperate climate of the Isle of France admits of the silk-worms being much more exposed to the weather than they are either in France or Italy. M. Chazal has therefore adopted the Indian, in preference to the European mode of management, as being equally efficacious and much cheaper.

The houses or sheds in which the silk-worms are kept, are composed of lattice-work, plastered over with a mixture of clay and cow-dung, and covered with a thatched roof. Their breadth is about fifteen feet, their height eight feet, and their length is regulated by the number of worms to be accommodated, and other circumstances. In the middle is a path of a convenient width, and on each hand are tiers or stages of open frames or shallow boxes made of bamboo, in which the worms are placed: eight inches in height are sufficient for each frame, including the space between that and the next, so that the house contains twelve stages. Each worm when ready to spin, is transferred to a small cell made of platted bamboo, as practised in Bengal.

The worms hatched from the eggs brought from Bengal, whether they had suffered from the voyage, from the change of climate, or other circumstances, did not attain to the size natural to them in India, and afforded but little silk: those of the second generation, however, produced from eggs laid by the imported worms, were both larger and yielded a better produce of silk both in quantity and quality. The fourth generation appeared to be perfectly inured to the climate and mode of management, and were not at all inferior to those grown in Bengal.

There are five generations of silk-worms annually in Bengal. In the Isle of France M. Chazal obtained three generations from December to May, and the mulberry affords fresh leaves during the whole year.

In 1817 M. Chazal, besides distributing silk-worms to various persons in the colony, collected more than two hundred pounds of silk, of which one bale weighing, net, one hundred and sixteen pounds and six ounces, was sent to England in the year 1818, and in the spring of 1819 M. Chazal's claim to the premium offered by the Society was sent in. The want of some official documents, and the time required to obtain them from so distant a colony, as well as other circumstances, have occasioned the delay in the adjudication of the claim.

CERTIFICATES.

THESE are to certify that the silk, of which a sample is sent to the Society for the encouragement of Arts, was brought to England on board H. M. ship Phaeton, in

February 1818, under my care, and which weighs one hundred and sixteen pounds and six ounces; that it was produced in the district of the Plaines of Wilhelms in the Isle of France, in the year 1817, under the care and management of Mr. Chazal, inhabitant of that district, from silk-worms bred there by him; and that the annexed account of the management of the worms, the cultivation of the mulberry-trees, and mode of feeding, is correct, and agreeable to what I have myself witnessed at Mr. Chazal's habitation.

Given under my hand this sixth day of October, 1818,
St. James-street, Westminster,
R. T. FARQUHAR,
Governor and commander-in-chief of the
Isle of France and dependencies.

London, 5th February, 1822.

WE hereby certify that our house (then under the firm of Mathison, Johnston, and Co.), received by H. M. ship Phaeton in the spring of 1818, the undermentioned bale of silk from Mr. de Chazal of the Isle of France, which we verily believe was the produce of silk-worms in that island.

MATHISON, JENKINS, AND CO.

Chazal—one bale of silk, weight, net, 116 lbs. 6 oz.

Sir, Lime-street-square, 3d February, 1823.

Referring to our letter under date 5th February 1822, respecting silk from the Isle of France, which subject is, we understand, soon to be brought before the Society of Arts, we beg to transmit a copy of a letter from Messrs. Simmons, Pallister, and Co., who undertook to get some raw silk made up, produced at Mauritius previous to that of which a specimen was sent to the Society, and also a small part of the ribbons and sarcenet made therefrom and taken off before the pieces were sent out to the island. The sarcenet, as you will observe, has been in use, and consequently looks worn on one side.

We are, Sir,
&c. &c. &c.
Mathison, Jenkins, and Co.

A. Aikin, Esq.
Secretary, &c. &c.

(Copy.)

29, St. Paul's Church-yard,
Sir, 17th March, 1817.

In answer to your enquiries respecting the samples of raw silk from the Isle of France, which you delivered to us for the purpose of manufacturing into an article suitable to the nature of it, we beg leave to state that it is in progress, but not yet in any finished state. The delay is owing to the silk being of a kind perfectly new to this market, and to our manufacture. We first proposed making it into an article for a dress or gown, but found it would not completely answer that purpose, and on consulting some of our friends who have had experience in several branches of the silk manufacture of this country, we were advised it was the most suitable for silk-stockings, and in consequence we sent it to the neighbourhood of Derby, to be prepared for that purpose; but it has been brought back from thence, as, on closer inspection there, it was found to be much too good for stockings; so much so as by the manufacturers to be deemed, from its fineness, nearly *fifty* per cent. superior to what is employed for that purpose. We conceive, therefore, to use it for that purpose would be rather wasting the silk than making a fair trial of its texture, quality, and worth, and it is now preparing in the usual winding mills, in order to be woven either into ribbons or dress-silks, as may be most suitable to it, after it has undergone the usual processs of winding, warping, boiling, and dying.

We are, Sir,
&c. &c. &c.
(Signed) SIMMONS, PALLISTER, & WILKINSON.

In order to ascertain the quality of M. Chazal's silk, the committee directed that the samples sent to the Society should be put into the hands of Mr. Winkworth, a member and silk-manufacturer. This gentleman, besides carefully examining the silk himself, has shown it to some of the most eminent silk-brokers in London, and their joint opinion is contained in the following letter.

SIR, Paternoster-row, January 19, 1824.

I HAVE examined the silk intrusted to my care by the Society, and have also shown it to some of the most eminent silk-brokers in London, and we all agree in opinion that though there is much room for improvement in the quality, it is still a very saleable article in the market; worth at the present time from eleven to fourteen shillings per pound exclusive of the duty. There appear to be three sorts in the sample, each approximating to filatures regularly imported from India, and it is probable that the persons who superintended the culture in the Isle of France are well acquainted with the mode of preparation adopted in Bengal. I have separated the sorts and attached labels to each, on which you will find the present market prices, and the names they would bear if sold by the East India company.

I shall be happy to furnish you with any farther information that may be in my power, should what I have now written be deemed insufficient.

I am, Sir,
&c. &c. &c.
THOMAS WINKWORTH.

No. II.

EXTRACT OF MIMOSA BARK.

The sum of THIRTY GUINEAS *was this session presented to Mr. T.* KENT, *for his exertions in preparing and importing, from the colony of New South Wales, more than two tons of* EXTRACT OF MIMOSA BARK *for the use of tanners.*

IT appears from an inquiry instituted by the Society last session, at the request of Earl Bathurst, secretary of state for the colonies, that since the great extension of the trade with South America, there are many thousand hides imported thence into this country, a considerable proportion of which, from a want of a sufficiency of native tanning materials, are obliged to be sent to the continent of Europe in a raw state. While these hides remain in the merchants' warehouses they sustain much damage from weevils and other insects; and from their being exported raw, all the additional profit which would accrue from their conversion into leather is lost to the nation.

In consequence of the increased demand thus occasioned for tanning materials, some persons have made establishments in Dalmatia, and in other European countries where oak is abundant, for the purpose of obtaining the active parts of oak bark in the concentrated form of an extract, and thus materially diminishing the freight of the article. Extract of oak-bark thus prepared, sold in April 1822, (as appears from evidence given by the principal importer at the meeting of the committee above alluded to), at ninety pounds per ton, including duty.

In the year 1821, Mr. Kent, then resident at Sydney, New South Wales, communicated to Mr. Bigg the commissioner specimens of an extract for the use of tanners, prepared by him from the bark of a species of mimosa, a native of that country; and in the following year, 1822, he imported into England above two tons of the same. Of this quantity nearly half was purchased by Mr. Brewin, and the remainder by Mr. Thornton and other London tanners, at fifty pounds per ton.

These gentlemen last session gave evidence that the leather tanned by extract of mimosa is as good as that tanned with extract of oak-bark, and that a ton of the former will afford nearly as much leather as a ton of the latter.

The following is the process used by Mr. Kent in making the extract:

Take a quantity of mimosa bark, stripped from the trees in the spring months, that is, in August, September, and October, and, after the rough or outward coat is cut off, and whilst green, crush it by passing it through a mill constructed upon the principle of those mills which are used in the crushing of sugar-cane, but with this difference, that the rollers should be made of copper, and may be fluted. This done, the crushed bark is put into a copper boiler of clear water, in the proportion of one hundred pounds of crushed bark to one hundred gallons of water, and boiled gently two hours; after which run off the decoction into broad flat copper pans, through a sieve or other strainer, and evaporate to the consistence required.

One ton of bark produces four hundred weight of extract, when brought to the consistence of tar, and if concentrated to a hard substance, as pitch, the produce is three hundred weight; but the evaporation, if carried to this extent, is liable to scorch and partially char the extract, and therefore is to be avoided.

No. III.

FINE WOOL FROM NEW SOUTH WALES.

The LARGE GOLD MEDAL, the premium offered, was this session presented to JOHN M'ARTHUR, Esq. of Sydney, New South Wales, for the importation of eighty bales of FINE WOOL, in entire fleeces, the produce of his flocks in that colony. The following communication has been received from Mr. M'Arthur on the subject; and samples of the wool have been placed in the Society's repository.

SIR, London, February 23, 1824.

I TRANSMIT with this some samples of New South Wales' wool, in fleeces, and unsorted, together with the bill of lading, and various certificates as to the quantity and quality of an importation made in the month of June last.

I am, Sir,
&c. &c. &c.
JOHN M'ARTHUR, Jun.

A. Aikin, Esq.
Secretary, &c. &c.

CERTIFICATES.

Mark-lane, February 10, 1824.

WE hereby certify that the largest quantity of fine wool (being more than two tons weight*) was imported from New South Wales in the month of July 1823, by John M'Arthur, Esq. per William Shand, Captain A. Kenn, and deposited in our warehouse, Duck's-foot-lane.

COOPER & SPRATT,
Public Warehouse Keepers.

66, Coleman-street, London, February 11, 1824.

I HEREBY certify, that John M'Arthur, Esq. imported in the William Shand, Captain A. Kenn, from New South Wales, eighty bales of sheep's wool, from which the fleeces now produced were selected; and that at least eight hundred pounds were equal in quality to the said fleeces.

I further certify, that I sold by public auction, on the 27th day of June last, the said eighty bales of wool, and that the net weight of wool therein exceeded eighteen thousand pounds, which is the largest quantity of fine wool imported from the colony of New South Wales by any house during the past year, (1823).

In comparing the fleeces with the wools of Spain and Germany, I am fully of opinion that the quality is superior to the finest wool imported from Spain, and equal to the average quality of German wool, with the exception of the finest sort, or Electoral wools of Saxony.

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* According to the bill of lading eighty bales, weighing 19,380 lbs.—*Secretary.*

THOS. EBSWORTH,
Sworn Wool Broker.

No. IV.

WOOL FROM NEW SOUTH WALES.

The LARGE SILVER MEDAL, the premium offered, was this session presented to HANNIBAL M'ARTHUR, Esq. of Sydney, New South Wales, for the importation of FINE WOOL, the produce of his flocks in that colony. The following documents have been received on the subject; and specimens of the wool have been placed in the Society's repository.

53, Old Broad-street, London,
November 29, 1823.

SIR,

I TAKE leave to enclose the bill of lading of the quantity, and the certificate of Mr. Marsh, the wool-broker, of the quality, of the last shipment of wool of the produce of the flocks of Hannibal M'Arthur, Esq. of New South Wales, and beg to submit his claim to your Society for such medal as you may think fit to award to him for the next largest quantity, and the next best in quality, to the produce of John M'Arthur, Esq. of that colony.

I am, Sir,
&c. &c. &c.
W. WILKINSON.

A. Aikin, Esq.
Secretary, &c. &c.

CERTIFICATES.

King's Arms-yard, Coleman-street, Nov. 29, 1823.

I HEREBY certify, that the wools per William Shand, particularized in the annexed bill of lading* marked H H M 1 to 35, the property of Hannibal M'Arthur, Esq. of New South Wales, were next in quality and quantity to the wools of John M'Arthur, Esq. of New South Wales, and obtained the next best prices.

JOHN MARSH, *Wool Broker*.

SIR, 53, Old Broad-street, January 2, 1824.

I BEG leave to send with this a sample, as required by your regulations, of the wools of the consignment of Mr. Hannibal M'Arthur, which should have accompanied my letter of the 29th November ult. to the Society, had I been aware of the necessity of submitting it.

I am, Sir,
&c. &c. &c.
W. WILKINSON.

A. Aikin, Esq.
Secretary, &c. &c.

London, January 2, 1824.

I HEREBY certify, that the sample of wool which accompanies this paper was a part of the wool consigned by

---

* Thirty-five bales, weighing 7,355 lbs. gross.—*Secretary*.

Mr. Hannibal M'Arthur of New South Wales to Mr. W. Wilkinson, and referred to in a former certificate of mine given to Mr. Wilkinson to be sent to the Society of Arts.

JOHN MARSH.

SIR, King's Arms-yard, May 6, 1824.

IN reference to the certificate I gave respecting the wools imported per the William Shand, I beg to state that the quality of the wool was fine, and of exceedingly good quality, so much so, that the manufacturer has declared it equal to a Saxon wool of second quality, and that the cloth produced was much admired for its firmness as well as softness.

I am, Sir,
&c. &c. &c.
JOHN MARSH.

A. Aikin, Esq.
Secretary, &c. &c.

No. V.

SUNDRY ARTICLES FROM NEW SOUTH WALES.

The Thanks of the Society were this session presented to ***Robert Wilmot Horton****, Esq., M. P., Under-Secretary of State for the Colonies, and Vice-President of the Society of Arts, &c. for sundry articles from New South Wales, presented by him to the Society, which have been placed in the Society's repository.*

Colonial Department, June 18, 1823.

Mr. Wilmot Horton presents his compliments to Mr. Aikin, and sends herewith specimens of various manufactures and productions from New South Wales, which Mr. Aikin will have the goodness to present to the Society of Arts.

A. Aikin, Esq.
Secretary, &c. &c.

The articles contained in two boxes, which accompanied Mr. Horton's letter, are—

1. Bark of a species of mimosa used by the settlers for tanning skins.
2. A specimen of kangaroo skin tanned by an infusion of No. 1.

3. Three samples of sole leather tanned with the same: one by S. Lord, Esq. of Sydney; one by Mr. W. Hibbert of Paramatta; one by Mr. Richard Wall of Paramatta.
4. Two jars of extract of mimosa bark prepared by Mr. Kent, and by him given to Mr. Commissioner Bigg.
5. Leaves of the *phormium tenax* (New Zealand flax) grown in New South Wales.
6. Fibre of the same, in various states of preparation.
7. Twine made of the same, both white and tarred.
8. White rope and small cordage made of the same.
9. Tarred rope of the same, made by Mr. Sims of Limehouse, and now under trial at Deptford and Sheerness by order of the Navy Board.
10. Coarse linen made of the same.
11. Stockings and brown cloth made in the colony of wool grown there.
12. Coarse hats made of the same, with a mixture of seals' wool.
13. Gum kino.
14. Gum acaroides.
15. Cortex magellanicus, with the leaves and wood of the same tree.
16. Sassafras-bark.

APPENDIX.

No. I.

THE following letter from Mr. Salisbury has been received since his paper on New Zealand flax, see p. 18, was printed.

SIR, Brompton, November 15, 1824.

I OBSERVE with great pleasure that the Society have honoured my communication on the naturalization of New Zealand flax with their attention, and that a premium is offered to encourage its cultivation. As this plant is become an object of great interest in Ireland, whatever may tend to promote that object will be paid great attention to in that country: I therefore beg leave to trouble the Society with a few observations in addition thereto.

The plant is remarkably shy in blooming, but it compensates for that by its inclination to produce offsets, when proper means are taken to cause that effect. With that view I planted twelve plants out in the open ground in May last, and having taken care they had a regular supply of moisture, I now find *thirty young plants* in addition, that, by May next, will be fit to plant out for a future stock; plants that were in a similar state in May last have now leaves upwards of two feet long.

Thus, by a diligent attention to the propagation and culture of this plant, an addition will be made to those laudable improvements in the agriculture and manufactures of this country for which your Society have of late years appeared so pre-eminent, and at the same time the philanthropic object of the society for whom I act as agent, *i. e.* "for bettering the condition of the Irish peasantry," will be promoted; it being on all hands admitted that whatever shall produce effective employment for the poor of that country, and thereby render them comforts of their *own* acquiring, will be the most effectual means of restoring that nation to peace and tranquillity.

No. II.

MR. HARDY'S CLOCK.

In the 38th vol. of the Transactions is a detailed description of Mr. Hardy's clock, for which the large gold medal and fifty guineas were voted to him by the Society. In the 39th vol. are inserted two tables, showing the rate of going of two of Mr. Hardy's clocks, one at the Royal Observatory, Greenwich, the other at the Royal Military College, Sandhurst.

A clock was made by Mr. Hardy on the same principles as the two above-mentioned for the observatory at Wilna; and the following table shows the rate of its going from November 27, 1820, to November 19, 1823.

The table was inclosed in a letter from M. Slawinski, dated Wilna, 26th March, 1824, addressed to Mr. Herschel, and containing the following statement.

"Toutes ces observations montrent bien que la marche de cette pendule est tres regulière. Même on pourrait bien attribuer la moitie des petits ecarts que l'on y apperçoit à une petite incertitude d'une à deux secondes en arc, qu'on à quelquefois ici dans la position de la lunette. Veuillez bien, monsieur, faire part de ces observations à M. Hardy comme une hommage rendu à ces soins qu'il a pris dans l'execution de cette pendule."

[*Translation.*—All these observations clearly show that the going of the clock is very regular. Of the small differences which are here observable, half their amount may probably be attributed to a small uncertainty, occasionally amounting to one or two seconds of an arc, in the position of the transit instrument. Have the goodness, sir, to communicate to Mr. Hardy these observations in acknowledgement of the care which he has taken in the construction of this clock.]

Observations with the large Transit Instrument at Wilna.

Date.	Names of Stars.	Mean time of the passage of stars over the meridian.			Daily retardation.	Reaumur's Therm.
1820		H.	′	″	″	
November 27	- Arcturus -	14	8	2.8	- -	2.25
28	- - -	—	8	2.4	0.4	2.
December 1	- - -	—	8	1.2	0.4	1.75
3	- - -	—	8	0.4	0.4	1.75
15	- - -	—	7	55.2	0.43	2.
20	- - -	—	7	53.2	0.4	3.
December 1	*a* Spica Virginis	13	16	18.9	- -	1.75
3	- - -	—	16	17.8		
1821						
March 21	- *a* Aquilæ -	19	41	45.4	- -	3.
24	- - -	—	41	44.5	0.3	3.25
25	- - -	—	41	44.2	0.3	3.
26	- - -	—	41	43.8	0.4	2.75

[The winding up of the clock having been forgotten, it stopped on the 27th March. The nut of the pendulum was then raised half a division, and it was again put into beat.]

Date.	Names of Stars.	Mean time of the passage of stars over the meridian.			Daily retardation.	Reaumur's Therm.
31	- - -	—	41	46.2	- -	4.5
April - 1	- - -	—	41	46.	0.2	4.75
5	- - -	—	41	44.7	0.32	5.5
10	- - -	—	41	43.6	0.22	6.
22	- - -	—	41	41.7	0.16	9.
28	- - -	—	41	39.4	0.38	12.25
1823	- - -					
April - 14	- Sirius -	6	30	54.5	- -	4.5
15	- - -	—	30	54.15	0.35	5.
23	- - -	—	30	49.23	0.61	5.
27	- - -	—	30	47.75	0.37	6.
May - 3	- - -	—	30	44.45	0.55	6.5
16	- - -	—	30	39.5	0.38	10.
19	- - -	—	30	38.55	0.31	10.5
22	- - -	—	30	36.05	0.83	12.75
June - 3	- - -	—	30	28.5	0.63	14.5
5	- - -	—	30	27.4	0.55	15.5
10	- - -	—	30	25.	0.48	16.5
26	- - -	—	30	15.55	0.59	14.25
April - 26	- *a* Aquilæ -	19	35	35.4	- -	5.75
May - 1	- - -	—	35	33.7	0.34	6.
4	- - -	—	35	32.2	0.5	6.5
6	- - -	—	35	31.4	0.4	5.75
12	- - -	—	35	29.5	0.31	7.
October 29	- - -	—	33	35.4	0.67	4.25
November 10	- - -	—	33	29.	0.54	4.
19	- - -	—	33	25.1	0.43	3.5

PRESENTS

RECEIVED BY THE SOCIETY FROM DECEMBER 1823 TO DECEMBER 1824,

WITH THE NAMES OF THE DONORS.

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Progrés de l'Industrie Françaises.

Discours prononcé le 2 Juin, 1823, du Commerce et de ses Travaux Publics en Angleterre et en France.

Extrait du Rapport fait à l'Institut sur les Memoires de M. Marestier relatifs aux Bateaux à Vapeur, et à la Marine des Etats-Unis d'Amerique.

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*** In the List of Presents, in the last volume, this work for 1823 was by accident omitted.

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Mr. D. Maclean's cloth manufactured entirely from fine wool the growth of the colony of New South Wales. See page 69.

Samples of plat from British grass in imitation of Leghorn. See page 74.

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Mr. Richard Soaper's ladle for paying the seams of ships, and improved pitch-kettle. See page 90.

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Mr. Raphael Clint's balanced masts. See page 107.

Mr. G. Smart's new mode of supporting top-masts. See page 111.

Lieut. W. J. T. Hood's improved screen glasses for quadrants and sextants. See page 115.

Mr. F. Watt's screw-wrench. See page 121.

Mr. T. Eddy's screw-wrench. See page 123.

Mr. J. Duce's quadruple lock. See page 125.

Mr. G. Welsh's original screw. See page 127.

Capt. Bagnold's improved culinary steam boiler. See page 130.

Mr. Bothway's apparatus for raising invalids in bed. See page 140.

Mr. J. Aitkin's remontoire escapement. See page 142.

Digitized

Mr. F. Richman's method of raising a sunken floor. See page 149.

Mr. A. Ainger's cast-iron trusses or cradles for sustaining decayed or sunken timbers. See page 153.

Mr. Stirling's working drawings of a steam-engine. See page 167.

IN COLONIES AND TRADE.—CLASS VI.

M. Chazal's specimens of silk from the Isle of France. See page 168.

Mr. T. Kent's extract of mimosa bark. See page 176.

Mr. J. M'Arthur's fine wool from New South Wales. See page 178.

Mr. Hannibal M'Arthur's wool from New South Wales. See page 180.

Sundry articles from New South Wales, from Robert Wilmot Horton, Esq., M. P. See page 183.

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d by Google

Mr. Dickinson's apparatus for Clearing Beer.

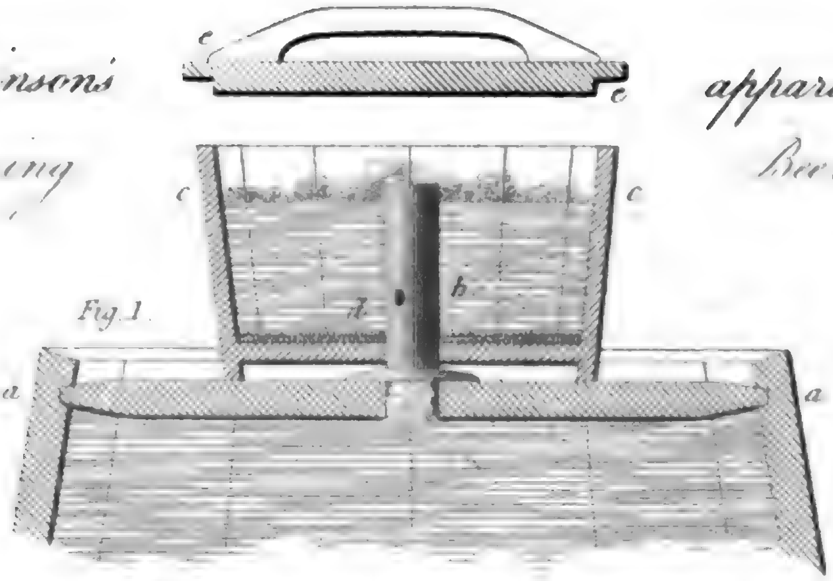


Fig. 1.

Mr. Wilkinson's safety Jet.

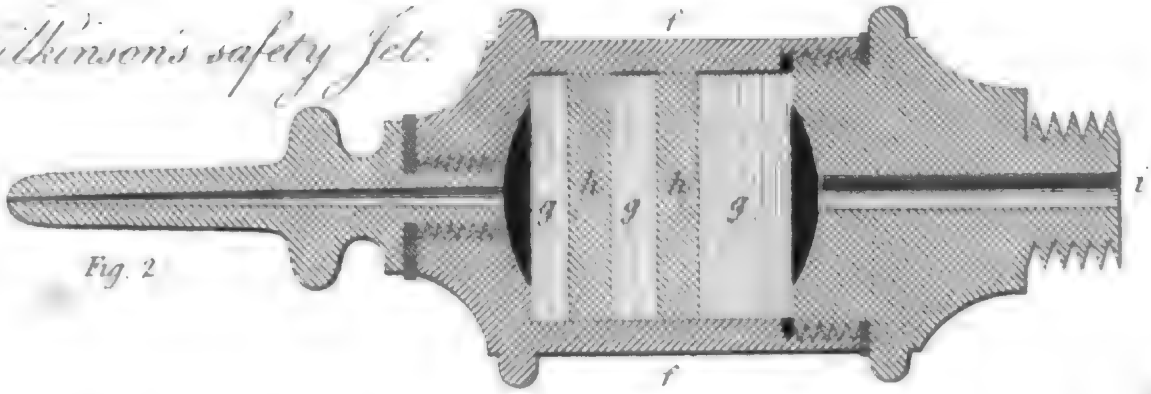


Fig. 2.

Mr. Gladwell's Plane

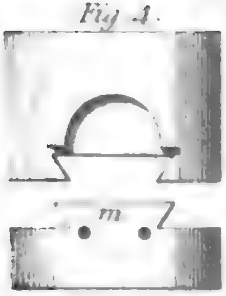
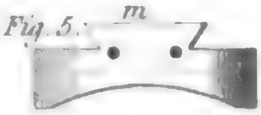


Fig. 4.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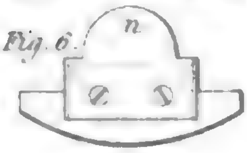
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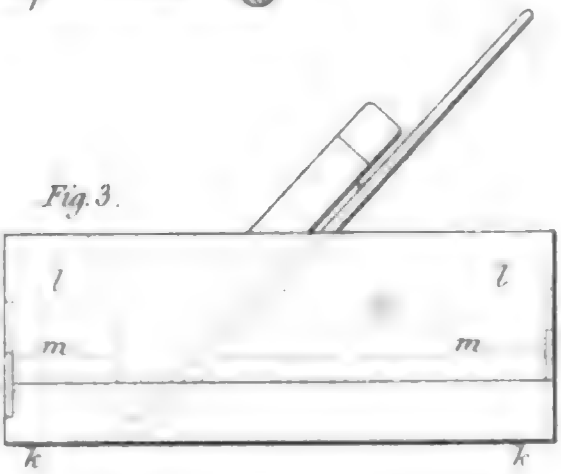
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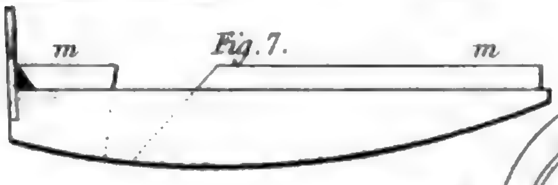
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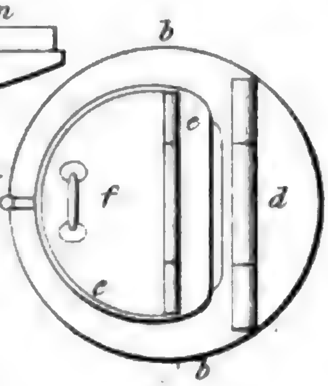
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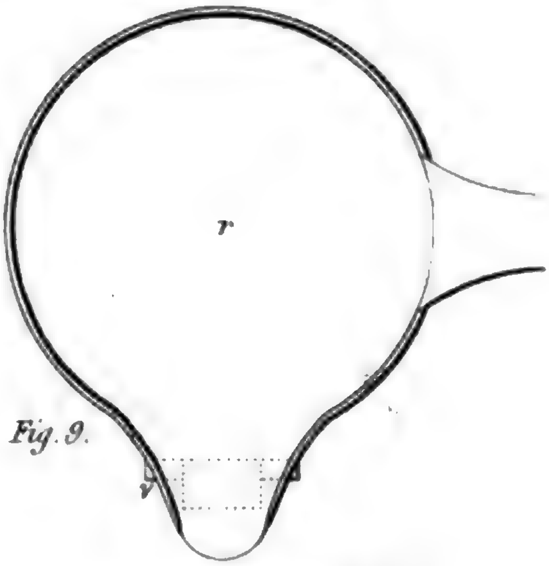
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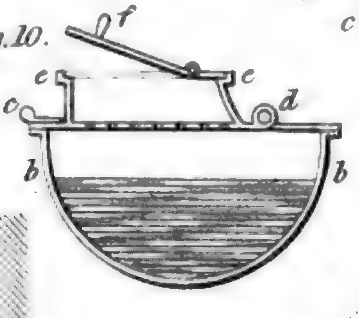


Fig. 10.

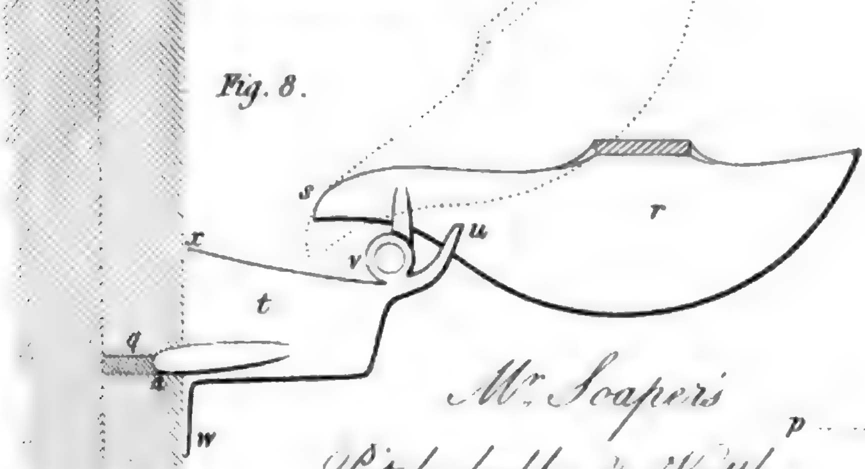
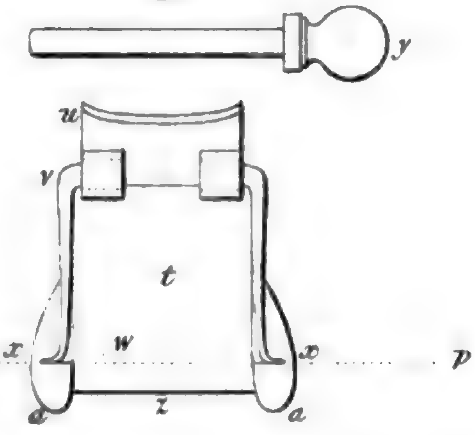


Fig. 8.



Mr. Soaper's Pitch ladle & Kettle.

Drawn by C Varley

Engraved by J.B. Tay

Mr. G. Chapman's mode of consuming the smoke of steam boilers

Fig. 1.

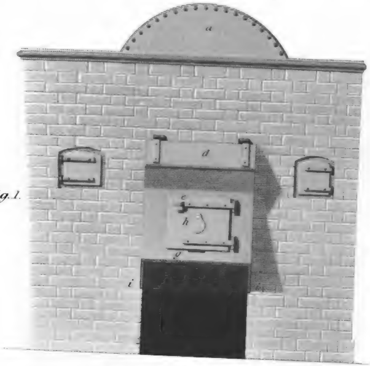


Fig. 3

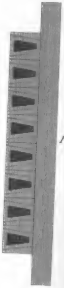
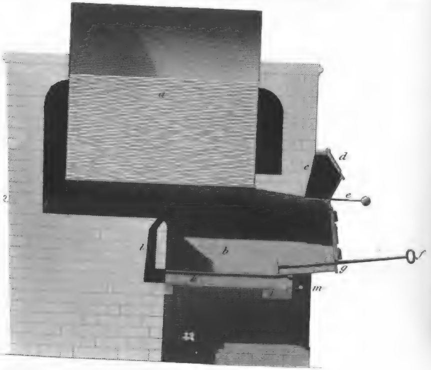


Fig. 2.



Drawn by H. W. Reveley

Engraved by John Cleghorn

Mr. Ed. Speer's concentric Chucks.

Fig. 2.

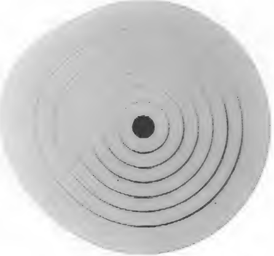
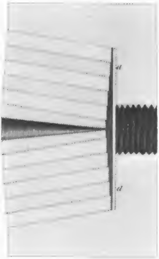


Fig. 1.



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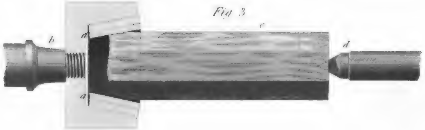
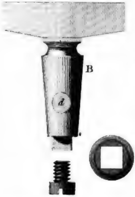


Mr. T. Griffiths' Stop-Cock.

Fig. 5.



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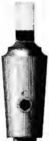
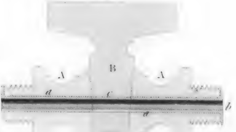


Fig. 4.



Drawn by J. Clements.

Engraved by G. Gladwin.

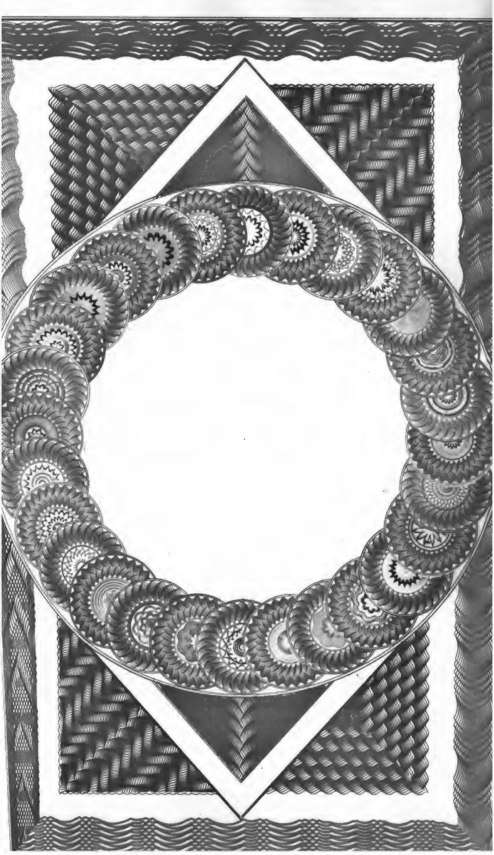
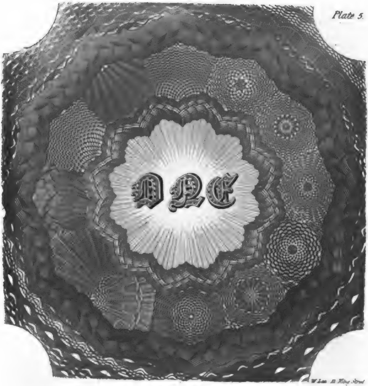
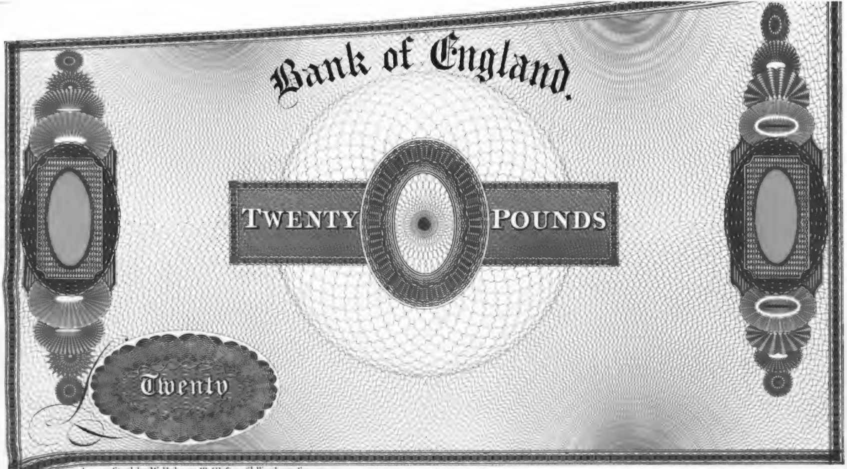


Plate 5.

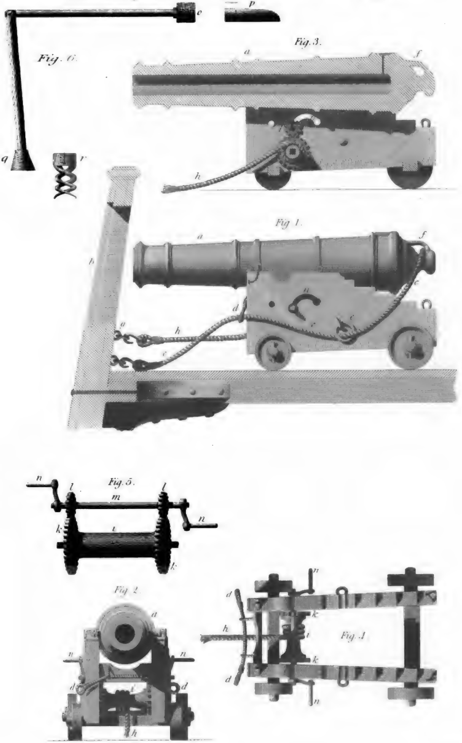


W Lee 13 King Street



Engraved upon Steel by W. Palmer. 18. Clifton S^t^ Finsbury Square

Lieut. W. P. Green's carriage & tackle for Ship's Guns.



Henry W. Reveley del.

Kelsall Sculp.

apt.n Geo. G. Burton's improved method of letting go the Anchor.

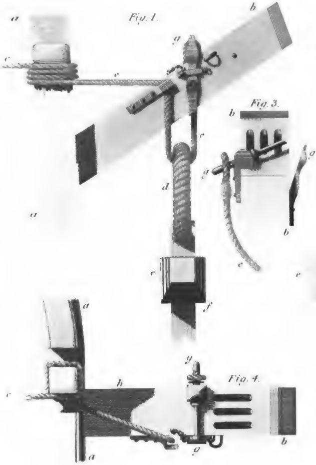


Fig. 1.
Fig. 3.
Fig. 4.

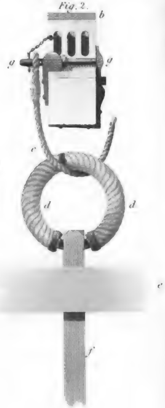


Fig. 2.

Fig. 5.

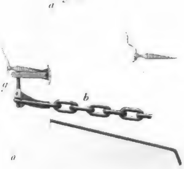


Fig. 6.

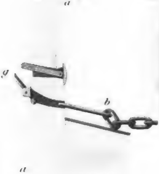


Fig. 7.

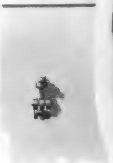


Fig. 8.

Drawn by H. W. [illegible]

Engraved by John [illegible]

Mr G. Smart's method of striking a topmast.

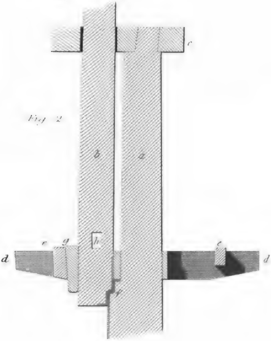


Fig. 2

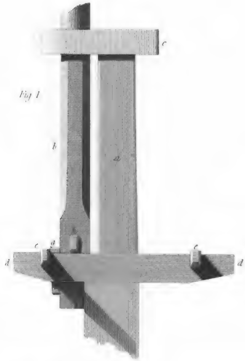
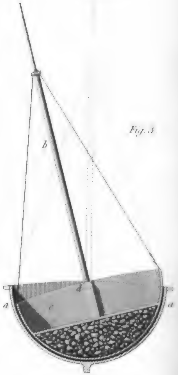


Fig. 1

Mr R. Clint's balanced masts.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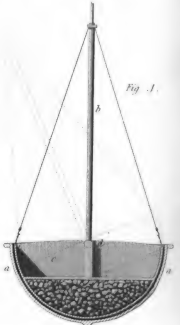


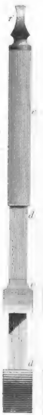
Fig. 4.

Drawn by S. Staples.

Engraved by J. B Tay

Mr. G. Eddy's Screw-wrench.

Lieut. W. J. J. Hood's improved Quadrant.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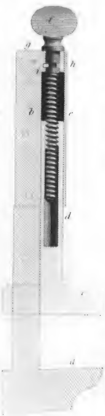


Fig. 6.

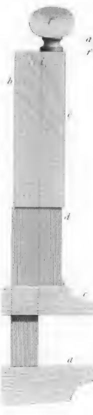


Fig. 5.

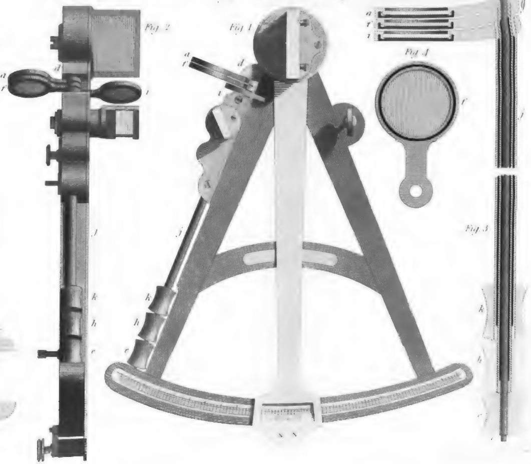
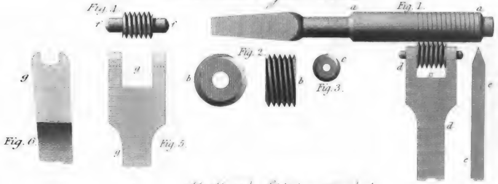
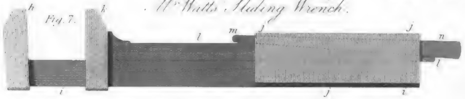


Fig. 2
Fig. 1
Fig. 4
Fig. 3

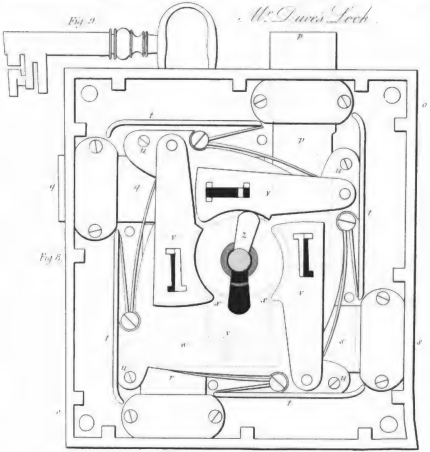
Mr. Welsh's Original Screw.



Mr. Watts' Sliding Wrench.



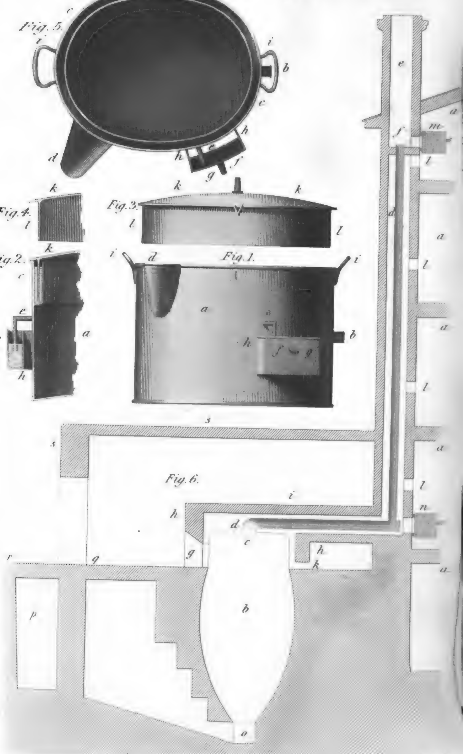
Mr. Duce's Lock.



[illegible]

Engraved by J.B.Tai

Capt. Bagnold's steam culinary apparatus.



Mr. T. Bewley's mode of [illegible]

Plate 13.

Nº. 7. Bothways apparatus for raising invalids in bed.

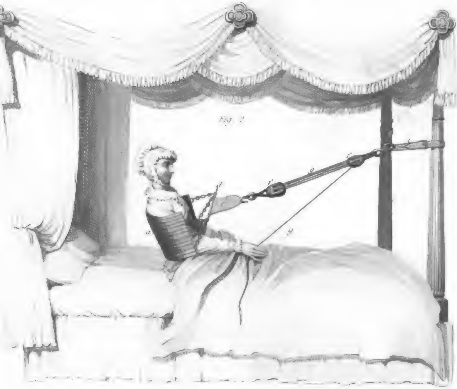


Fig. 2

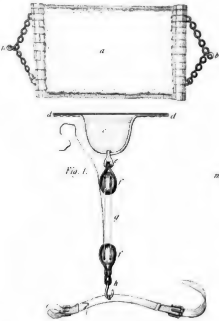
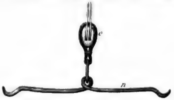


Fig. 1.



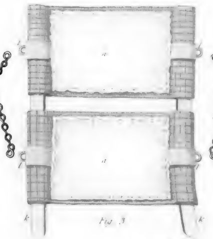
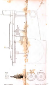


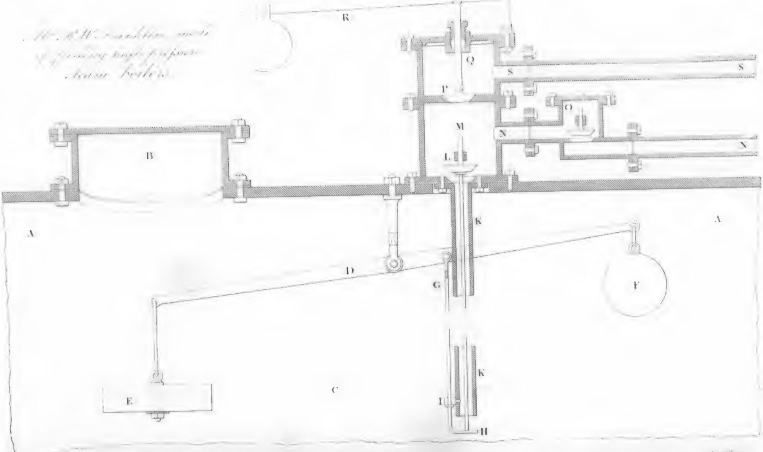
Fig. 3

H. R. Bewly Delᵗ

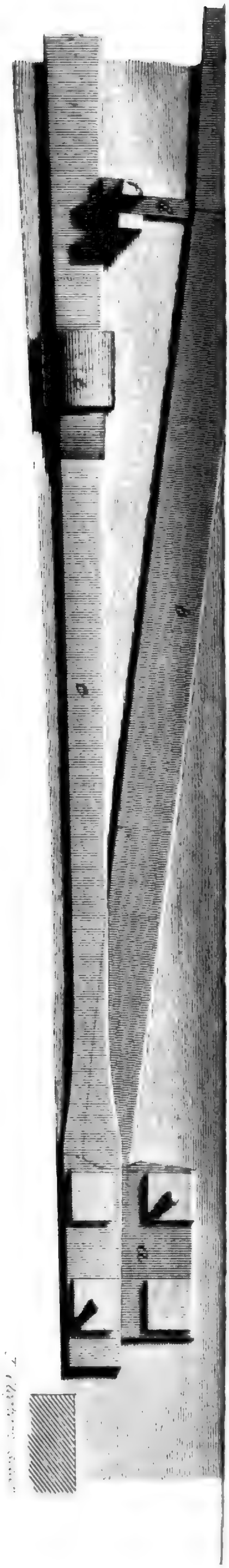
A. W. Warren. Sculpᵗ



[illegible] [illegible] [illegible]
[illegible] [illegible] [illegible]
steam boilers.



Drawn by J. Clement [illegible]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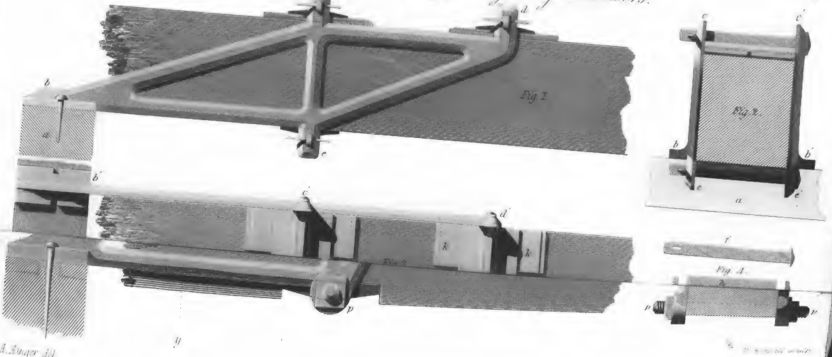
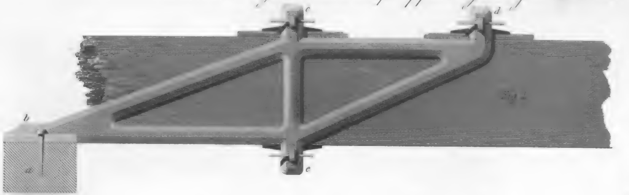
Mr. A. Singer's methods of supporting decayed Timbers.



A. Singer del.

Mr. A. Ainger's methods of supporting decayed Timbers.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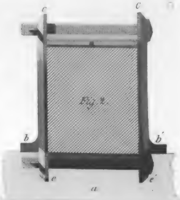
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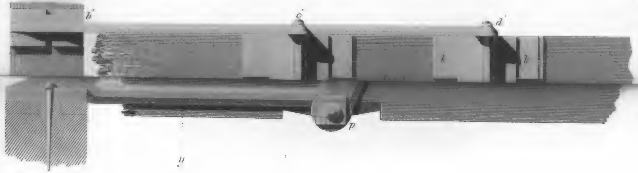
Fig. 3.

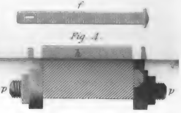
Fig. 4.

A. Ainger del.

W. Kelsall sculp.

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N. B. Those marked ** pay Five Guineas annually; those marked with * Three Guineas annually; those with P are perpetual members; those with † have served the office of steward.

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P Anspach, Elizabeth, Margravine of
† Acland, Sir Thomas Dyke, Bart. M. P. *Killerton, Devon*
P Antrobus, Sir Edmund, Bart., F. R. S. F. S. A. M. R. I. *Hyde-park-corner, and Eaton-Hall, Congleton*
Arkwright, Sir Rich., Bart. F. H. S. *Cromford, Derbyshire*

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Abingdon, Mr. L. J.
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Abraham, John Hepey, Esq. *Sheffield.*
Abraham, Robert, Esq. 27, *Keppel-street*
† Ackerman, Mr. Rudolph, 101, *Strand*
P Ackers, James, Esq. *Lark Hill, near Manchester*
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P Adam, James, Esq. *Lower Milnthorp, Kendal*
Adams, Mr. Dudley
Adams, Mr. George, 28, *Haymarket*
Adams, Mr. Jesse, *Gas Works, Dorset-street*

Adams, Mr. John, jun. 2, *Prospect-place, Lambeth*
Adams, Quincey, Esq. *United States*
Adams, Mr. William, 10, *Buckingham-street, Adelphi*
Addison, R. Esq. *Batavia*
Addison, Robert, Esq. *Rugby Hotel*
Adrian, Mr. W. T. *Pentonville*
Agace, Daniel, Esq. 26, *Gower-street*
Agar, John, Esq. 59, *Stafford-place, Pimlico*
† Agar, James, Esq. F. H. S. 5, *Hare-court, Temple*
Aikin, Mr. George, *Harlington, Bedfordshire*
P† Ainger, Mr. Alfred, 22, *Everett-street*
Ainslie, Henry, M. D. 25, *Dover-street*
Ainsworth, Richard. Esq. *Moss Bank, near Bolton*
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Alderson, Edward, Esq. 13, *Tavistock-street, Bedford-sq.*
Aldridge, John, Esq. 9, *Lincoln's-inn*
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Alexander, E. N. Esq. *Halifax, Yorkshire*
Alexander, Robert, Esq. 3, *Essex-court, Temple*
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Alvarez, Joseph, Esq.
P Ames, John, Esq. *Clifton Wood, near Bristol*
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Annand, Alexander, Esq, 9, *Adelphi-terrace*
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Arnott, James M. Esq. 17, *New Burlington-street*
Ashley, Mr. Joshua, 44, *Charing-cross*
Ashton, Mr. Robert, *Queen's-buildings, Brompton*
Ashurst, Wm. Henry, Esq. 2, *Sambrook-court, Basinghall-st.*
Ashwell, Mr. James, *at B. Donkin's, Esq. Grange-road, Bermondsey*
Astbury, William, Esq. *Portugal-street, Lincoln's-inn-fields, and Islington*
P† Atcheson, Nathaniel, Esq. F. S. A. 35, *Winchester-street*
Atkins, John, Esq. (Alderman), 7, *Walbrook*
Atkinson, Peter, Esq. *York*
Atkinson, Thomas, Esq. *Old Swan-lane*
Atkinson, William, Esq. 9, *Paternoster-row*

† Attersol, Joseph, Esq. 1, *John-street, Berkeley-square*
P Austen, Benjamin, Esq. 32, *Guildford-street*
Austine, Mr. George, *(abroad)*
Ayer, C. A. Esq. 60, *Lower Grosvenor-street*
Aylmer, Mr. G. J. *Kennington School*

B

P**†Bedford, John, Duke of, V. P. F. S. A. F. L. S. F. H. S. 31, *St. James's-square, and Woburn, Bedfordshire*
Bathurst, Earl, K. G. *Secretary of State for the Colonies, Great Stanhope-street, and Oakley, Gloucestershire*
P Beverley, Algernon, Earl of, 8, *Portman-square*
Breadalbane, John, Earl of, F. R. S. F. H. S. 21, *Park-lane, and Kelchburn Castle, Argyleshire*
P Bristol, Frederick William, Earl of, F. R. S. *St. James's-square, and Ickworth Park, Suffolk*
P Buchan, David, Earl of, LL. D. F. R. S.
Braybrooke, Richard, Lord, F. R. S. F. S. A. F. H. S. 10, *New Burlington-street*
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INDEX.

A

Advertisement, general, describing the objects of the Society,—the meetings of the Society,—the form for proposing members,—ladies being eligible, as members, to vote by proxy at elections,—members entitled to vote and assist in the business of the Society,—their privilege of recommending two persons as visitors at the meetings of the Society, and introducing their friends to examine the various models, &c., iii.;—members to have the use of the Society's library,—invitation to members and others to augment the library by contributions,—form offered to persons inclined to leave money to the Society by will,—the Society not responsible for any opinion or representation of facts contained in their volumes,—the public requested to guard against impositions from persons advertising as having patents for articles sold under the pretended sanction of the Society's name,—Society's publications,—manner of communicating, iv.

Agriculture, conditions to guide candidates in, vii.,—premiums in, vii. to xv.,—papers in, 3 to 22.

Ainger, Mr. A., the large gold medal to, for his mode of supporting beams or other timbers, the ends of which have become decayed, xlviii.,—his communication respecting, 153.

Aitkin, Mr. J., twenty guineas to, for a remontoire escapement, xlviii.,—his communication on the subject, 142.

Andre, jun., Mr. P., the silver Isis medal to, for a landscape, xliv.

Andrews, Mr. G. T., the silver Isis medal to, for a design in architecture, xlvi.

Annatto, communication respecting East Indian, 39.

Apparatus for clearing beer, communication from Mr. R. W. Dickinson respecting an, 23.

Apparatus for the use of invalids, Mr. J. Bothway's communication respecting, 140.

B

Bagnold, Captain, the silver Vulcan medal to, for an improved culinary steam-boiler, xlvii,—his communication respecting, 130.

Balanced masts, Mr. R. Clint's communication respecting, 107.

Barlow, Mr. P. W., the large silver medal to, for a perspective view of a transit theodolite, xlvii.

Barrett, Mr. T., the silver Isis medal to, for a landscape, xlv.

Bartrum, Miss E., the silver palette to, for a head in chalk, xlv.

Bewley, T. Esq., the large silver medal to, for an improved mode of heating manufactories, xlviii.,—his communication respecting, 134.

Bloomfield, Mrs. E., five guineas to, for a bonnet made of British grass, xlvii., 77.

Blyth, Henry, Esq., the large gold medal to, for embanking land from the sea, xliv.,—his communication respecting, 5.

Bothway, Mr. J., the silver Vulcan medal to, for an apparatus for raising invalids in bed, xlviii.,—his communication respecting, 140.

British opium, communication from Messrs. Cowley and Staines respecting, 9.

Brown, Mr. G., the silver Isis medal to, for an historical subject, xlvi.

Burbank, Miss Leonora, the silver Isis medal to, for a head in chalk, xlvi.

Burton, G. G. Esq., Captain R.N., the large silver medal to, for his improved mode of securing an anchor, xlviii,—his communication respecting, 99.

Butler, Mr. T., the large silver medal to, for a model, xlvi.

C.

Candidates, general notice to, v.

Carpenters' plane, Mr. G. Gladwell's, 83.

Caron, Mr. P., five guineas to, for preventing the watering of plain silks, xlvii.,—his communications respecting, 80.

Cast-iron trusses or cradles for sustaining decayed or sunken timbers, communication from Mr. A. Ainger respecting, 153.

Catalogue of the models, machines, &c. &c., received since the publication of the 41st vol. of the transactions, 198.

Chapman, Mr. G., the large silver medal to, for a mode of consuming the smoke of steam-engine boilers, xliv,—his communication respecting, 32.

Chazal, M., the large gold medal to, for silk the produce of the Isle of France, xlviii,—his communication respecting, 169.

Chemistry, dyeing, and mineralogy, premiums in, 23 to 42.

Clint, Mr. R., the large silver medal or twenty guineas to, for his balanced masts, xlviii.,—his communication respecting, 107.

Clint, Mr. S., the large silver medal to, for a medal die of a head, xlvii.

Cloth made of New South Wales' wool, communications from D. Maclean, Esq. respecting, 68.

Cobbing and Co., Messrs., the silver Ceres medal to, for a bonnet made of British grass, xlvii., 77.

Colonies and Trade, premiums in, xxxviii to xliii., papers in 168 to 184.

Collins, Miss. M. E., the silver Ceres medal to, for a bonnet made of British grass, xlvii.

Concentric chucks for turners, Mr. E. Speer's communication respecting, 86.

Cowley and Staines, Messrs., thirty guineas to, for cultivating twelve acres of poppies, and obtaining therefrom opium, xliv., —their communication respecting, 9.

Cox, Miss S., the silver palette to, for a portrait, xlv.

——— the large silver medal to, for a drawing in chalk, xlvi.

D

Dalton, Mr. E., the silver palette to, for a finished drawing from the antique, xlvi.

Deare, Mr. J. the silver Isis medal to, for a bas-relief, xlvi.

——— the silver Isis medal to, for a model, ib.

Denman, Mr. J. F. the silver Isis medal to, for a drawing in chalk, xlvi.

Desvignes, Mr. P. H., the silver Isis medal to, for a perspective view of Pancras New Church, xlvi.

Dickinson, Mr. R. W., the large silver medal to, for a machine for clearing beer while in fermentation, xliv.,—his communication respecting, 23.

Duce, Mr. J., the silver Vulcan medal and ten guineas to, for a quadruple lock for safe chests, &c., xlvii.,—his communication respecting, 125.

E

East Indian Annatto, communication respecting, 39.

Edwards, Mr. E., the large silver medal to, for a bas-relief, xlvi., —the silver Isis medal to, for a bust, ib.

Eddy, Mr. T., the silver Vulcan medal to, for a screw-wrench, xlvii.,—his communication respecting, 123.

Eggbrecht, Mr. J., the silver Isis medal to, for a portrait, xlv.

——— ———, the silver Isis medal to, for a composition in still-life, xliv.

———, Miss A., the silver palette to, for a portrait, xliv.,—the silver Isis medal to, for a composition in still-life, ib.

Embanking land from the sea, communication from Henry Blyth, Esq. on, 5.

Engraving on steel plate, communication respecting, 53,—letter from R. H. Solly, Esq. offering to present impressions from an engraving, &c. for frontispiece to vol. XLII., 54,—letter from C. Turner, Esq. respecting, 55.

Extract of mimosa bark, communication from Mr. T. Kent respecting, 176.

F

Ferguson, Mr. J., the special thanks of the Society to, for his communication on the prevention of forgery, xlviii.,—his plan, 60.

Fincher, Mr. Joseph, the special thanks of the Society to, for his proposed plan for preventing fraudulent erasures in bankers' checques, 58.

Franklin, Mr. R. W., the large silver medal and fifteen guineas to, for an improved mode of feeding the boilers of high-pressure steam-engines, xlviii,—his communication respecting, 146.

G

Gilbert, Mr. J. M., the gold Isis medal to, for a view of shipping, xliv.

Gill, Mr. W., the silver palette to, for a composition in still-life, xliv.

—— ——, the silver palette to, for a drawing in chalk, xlvi.

Gladwell, Mr. G., five guineas to, for an improved plane for carpenters, xlvii.,—his communication respecting, 83.

Gray, Miss C. F., the silver palette to, for a landscape in pencil, xlv.

Griffiths, Mr. T., the silver Vulcan medal to, for an improved stop-cock for chemical purposes, xliv.,—his communication respecting, 29.

Green, Mr. B. R., the silver palette to, for a drawing in chalk, xlvi.

——, Lieut. W. P., the large silver medal to, for improvements in working ships' guns, xlvii.,—his communication respecting, 93.

——, Miss L. J., the silver palette to, for a miniature composition, xlv.

Gun-carriage for naval use, and jointed ramrod, communication from Mr. W. Pringle Green, Lieut. R.N. respecting, 193.

Guy, Miss E., the silver Isis medal to, for an historical subject, xlv.,—the silver Isis medal to, for a landscape in pencil, ib.

——, Miss J. S., the silver palette to, for a landscape, xlv.

H

Hamlyn, Miss Augusta, the silver palette to, for a drawing in chalk, xlvi.

Hardy, Mr., further particulars respecting his clock, &c. (*see Appendix*), 186.

Hats or bonnets of British manufacture in imitation of Leghorn, communications respecting, 74.

Hartman, Miss M., the large silver medal to, for an historical subject, xlv.

Hilditch, Mr. G., the silver Isis medal to, for an historical subject, xliv.

Hollowell, Miss L., fifteen guineas to, for a bonnet made of British grass, xlvii., 75.

Hood, Mr. W. J. T., Lieut. R.N., the gold Vulcan medal to, for his improved quadrant for naval use, xlviii.,—his communication respecting, 115.

Hopkins, Miss A., the large silver medal to, for a landscape, xlv.

Horton, Robert Wilmot, Esq. M.P., the thanks of the Society to, for sundry articles the produce of New South Wales, &c., xlviii.,—communication respecting, 183.

Howe, Mr. James, the silver Isis medal to, for a miniature in wax, xlvii.

Hull, Miss M. J., the silver palette to, for a composition of flowers, xlv.

Hurd, Philip, Esq., the large gold medal to, for raising oaks for timber, xliv.,—his communication respecting, 2.

Hurst, Jane, two guineas to, for a bonnet made of British grass, xlvii., 77.

I

Improved safety-chamber to the oxy-hydrogen blow-pipe, communication from Mr. H. Wilkinson respecting, 26.

Improved method of letting go the anchor, Captain Burton's commuication respecting, 99.

Improved screen-glasses for quadrants and sextants, Lieut. W. J. T. Hood's communication respecting, 115.

J

Johnson, Mr. H., the silver Isis medal to, for a portrait, xliv.

K

Kent, Mr. T., thirty guineas to, for preparing and importing from New South Wales extract of mimosa bark for the use of tanners, xlviii.,—his communication respecting, 176.

Knight, jun., Mr. E., the gold Isis medal to, for a landscape, xliv.

L

Ladle for paying the seams of ships, and improved pitch-kettle, communication from Mr. R. Soaper respecting, 90.

Laurance, Miss Di., the silver Isis medal to, for a drawing in chalk, xlvi.

Lea, Mr., the special thanks of the Society for his communication on the prevention of forgery, xlviii.,—his communication, 63.

Lightfoot, Miss H.M., the silver palette to, for a head in chalk, xlv.

————, Miss M. J., the silver palette to, for a head in chalk, xlv.

M

Maclean, D. Esq., the gold Isis medal to, for cloth made of New South Wales' wool, xlvii.,—his communication respecting, 68.

Magnetic guard for needle-pointers, the special thanks of the Society to Mr. A. Westcott for his communication respecting, 165.

Manufactures, premiums in, xxxi. to xxxiv.,—papers in, 69 to 82.

Marshall, Mary, the silver Ceres medal to, for a bonnet made of British grass, xlvii., 76.

Marbles, on exposing specimens of British, xliii.

Mattheson, Mrs., the silver palette to, for an historical subject, xlv.

M'Arthur, John, Esq., the large gold medal to, for the importation of the greatest quantity of fine wool, the produce of his own flocks, xlviii.,—his communication respecting, 178.

————, Hannibal, Esq., the large silver medal to, for the importation of the next greatest quantity of fine wool, the produce of his own flocks, xlviii.,—his communication respecting, 180.

M'Michael, Mrs., five guineas to, for a bonnet made of British grass, xlvii., 77.

Mears, Mrs., the silver Ceres medal to, for a bonnet made of British grass, xlviii., 76.

Mechanics, premiums in, xxxiv. to xxxvii.,—papers in 83 to 167.

Menstruum for biting-in on steel-plates, communication from Mr. Edmund Turrell respecting, 43.

Mills, Mrs. E., ten guineas to, for a bonnet made of British grass, xlvii., 76.

Morrice, Mrs., fifteen guineas to, for a bonnet made of British grass, xlvii., 75.

Morris, Mr. W., the silver Isis medal to, for a perspective view of a Corinthian column, xlvii.

Muir, Messrs. James and A., the silver Ceres medal to, for a bonnet made of British grass, xlvii., 76.

Mumford, Miss, the silver palette to, for on historical subject in chalk, xlv.

N

Napier, Miss A. L., the silver palette to, for a composition of fruit, xlv.

National school at Nunney, two guineas to the children of the, for a bonnet made of British grass, xlvii.

Naturalization of New Zealand flax, communication from Mr. Salisbury respecting, 18,—additional information respecting, *(see Appendix)* 185.

New mode of supporting topmasts, Mr. G. Smart's communication respecting, 111.

New South Wales, the thanks of the Society to R. W. Horton, Esq., M.P., for sundry articles from, 182.

O

Oakes, Miss S. H., the silver Isis medal to, for a head in chalk, xlv.

Officers of the Society, a list of the, ii.

Opium, thirty guineas to Messrs. Cowley and Staines for the cultivation of British, xliv.,—their communication respecting, 9.

Original screw, Mr. G. Walsh's communication respecting, 127.

P

Paine, Mr. J. D., the large silver medal to, for a design in architecture, xlvi.

Palmer, Mr. W., the special thanks of the Society to, for his communication on the prevention of forgery, xlviii.,—his communication, 65.

Parminter, jun., Mr. G., the large silver medal to, for a design in architecture, xlvi.

Pasmore, Mr. D., the silver palette to, for an historical subject, xlv.,—the silver palette to, for a head in chalk, ib.

Pearsall, Mr. H., the large silver medal to, for a portrait, xliv.

Physick, Mr. E. G., the large silver medal to, for a group, xlvi.

Plan for consuming the smoke of steam-boilers, &c., communication from Mr. G. Chapman respecting, 32.

Plowman, Mr. T., the large silver medal to, for a design in architecture, xlvi.

Polite arts, premiums in xxi. to xxx.,—the conditions, xxxi.,—papers in, 43 to 68.

Presbury, Mr. G., the large silver medal to, for an historical engraving, xlvii.

Presents, 189.

Preventing fraudulent erasures in bankers' checques, the thanks of the Society to Mr. Joseph Fincher for his proposed plan for, 58.

——— the watering of silks, communication respecting, 80.

Prevention of forgery, further communications on the subject of, from Mr. Ferguson, Mr. Lea, and Mr. Palmer, 60.

Pyman, Mrs. S. the silver Ceres medal to, for a bonnet made of British grass, xlvii., 77.

Q

Quadruple lock, Mr. J. Duce's, 125.

R

Radclyffe, Mr. E. the silver Isis medal to, for an etching, xlvii.

Raising oaks, communication from Philip Hurd, Esq., on, 2.

Remontoire escapement, Mr. J. Aitkin's communication on the subject, 142.

Richman, Mr. F., the large silver medal to, for a method of raising a sunken floor, xlviii.—his communication respecting, 149.

Roberts, Mr. H., the large silver medal to, for a design in architecture, xlvi.

———, Mr. H., the large silver medal to, for a perspective drawing of a Corinthian capital, xlvii.

Robertson, Miss A. the silver Isis medal to, for a portrait, xliv.

———, ———, the large silver medal to, for an historical subject, xliv.

———, Miss Jesse, the silver palette to, for a landscape, xliv.

Robson, Miss J., the silver palette to, for a landscape in pen and ink, xlv.

S

Salisbury, Mr. Wm., the special thanks of the Society to, for a communication on the naturalization of New Zealand flax, 18, —additional information respecting, *(see Appendix)* 185.

Sargeant, Mr. J., the silver palette to, for an historical subject, xlv.

———, ——, the large silver medal to, for a model, xlvi.

School at Bandon, five guineas to the children at the, for a bonnet made of British grass, xlvii.

Screw-wrench, Mr. Fr. Watt's communication respecting, 121.

————, Mr. Thomas Eddy's communication, 123.

Self-acting feeder for high-pressure steam-boilers, Mr. R. W. Franklin's communication respecting, 146.

Slous, Mr. H., the large gold medal to, for an historical composition, xliv.

Smart, Mr. G., the gold Vulcan medal to, for an improved mode of supporting the topmasts of ships, xlviii,—his communication respecting, 111.

Smith, Mr. S. M. the silver Isis medal to, for a finished drawing from the antique, xlvi.

——, Miss M. the silver Isis medal to, for a miniature portrait, xiv.

Soaper, Mr. R., ten guineas to, for a pitch-kettle and ladle for paying the seams of ships, xlviii.,—communication respecting, 90.

Solomon, Mr. J. W., the large silver medal to, for an historical subject, xliv.

———, ————, the large silver medal to, for a finished drawing from the antique, xlvi.

Speer, Edward, Esq., the large silver medal to, for concentric chucks for turners, xlvii.,—his communication respecting, 86.

Stacey, Miss, the silver palette to, for a head in chalk, xlv.

Starling, Mr. M., the silver Isis medal to, for a landscape, xlv.

Steam culinary apparatus, Captain Bagnold's communication respecting, 130.

Stirling, Mr. J., twenty guineas to, for a set of working-drawings of a steam-engine, xlviii.,—his communication respecting, 167.

Stop-cock for transferring corrosive gases, communication from Mr. T. Griffiths respecting, 29.

Straker, jun., Mr. J., the silver Isis medal and ten guineas to, for a new mode of embossing on wood, xlvii.,—his communication respecting, 52.

Strickland, Miss Fr., the gold Isis medal to, for a composition of flowers, xiv.

Surry, Priscilla, fifteen guineas to, for a bonnet made of British grass, xlvii., 76.

T

Tatham, Mr. F. the silver palette to, for a model, xlvi.

Transit instrument at Wilna, observations with the large, *(see Appendix)* 188.

Turrell, Mr. Edm., the large gold medal to, for an improved menstruum for biting-in on steel-plate, xlvii.,—his communication respecting, 43.

Truss for raising a sunken floor, communication from Mr. F. Richman respecting, 149.

Twining, Miss, the silver Isis medal to, for an historical subject, xlv.

———, ——, the large silver medal to, for a portrait, ib.

———, Miss E., the silver palette to, for a portrait, xlv.

———, Miss Eliz., the large silver medal to, for a composition of flowers, xiv.

V

Venn, Mrs., the silver Ceres medal to, for a bonnet made of British grass, xlvii., 76.

W

Walsh, Mr. G., the silver Vulcan medal and ten guineas to, for an original screw, xlvii.,—his communication respecting, 127.

Warming manufactories, Mr. T. Bewley's communication respecting, 134.

Watson, Mr. J. B. the gold Isis medal to, for a design in architecture, xlvi.

———, ———, the silver Isis medal to, for a drawing, xlvii.

Watt, Mr. F., the silver Vulcan medal to, for a screw-wrench, xlvii.,—his communication respecting, 121.

Webber, Betty, ten guineas to, for a bonnet made of British grass, xlvii., 76.

Welford, jun. Mr. J. G., the silver palette to, for a perspective view of a Corinthian capital, xlvi.

Wetten, Mr. R. G., the gold medallion to, for a design in architecture, xlvi.

Westcott, Mr. A., the special thanks of the Society to, for his magnetic guard for persons employed in dry-grinding, xliii.

Wilkinson, Mr. H., the large silver medal to, for an improved safety-chamber to the oxy-hydrogen blow-pipe, xliv.,—his communication respecting, 26.

Williams, Mr. Edward, the silver palette to, for a drawing, xlv.

———, ———, the silver palette to, for a landscape, xlv.

———, Mr. Evan, the large silver medal to, for a portrait, xliv.

———, ———, the large silver medal to, for a composition in still-life, ib.

Working drawings of a steam-engine, communication respecting Mr. Stirling's, 167.

Wright, Mr. H. T. the silver palette to, for a drawing in outline, xlvi

MAR 23 1917